



AUDIT OF UTILITY STREET CUTS

ABSTRACT

The City has adequately designed quality assurance controls over utility street cuts; however, effectiveness is hindered by some City practices. This audit recommends improvements to facilitate permit management and increase assurance over street cut restoration quality.

City Auditor's Office



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Executive Summary

Honorable Mayor and members of the City Council,

The City Auditor's Office has completed a performance audit of the Utility Street Cuts process. The City of Denton currently owns just over 4,700 lane miles of roadway and was valued around \$310 million at the end of fiscal year 2018. Denton's roadway network is one of its largest and most expensive assets. This audit is intended to provide assurances on the City's ability to properly safeguard the integrity of its street's structure by evaluating the effectiveness of utility street cut controls.

The following are our salient findings:

- Established controls are well designed in accordance with best practices.
- The City's current patch standards appropriately require vertically T-shaped patch and concrete "flowable" backfill, which is a self-compacting material. However, the standards do not require patch joints to be sealed as best practices suggest. Unsealed pavement joints allow water and other materials to seep under the pavement surface and damage the underlying layers – potentially decreasing the useful life of the road around the patch.
- Permit documentation does not indicate that utility street cut patches are being tested using the prescribed ride quality test.
- External utilities are required to meet higher standards (see Appendix B), which reduce the risk of deterioration of roadways for their cuts. Internal utilities are required to meet fewer requirements than the external utilities.
- The City's quality assurance function has the following issues:
 - Water Utilities quality control activities do not ensure that the City's street cut restoration quality standards, as depicted in Appendix B, are met.
 - The Streets Division performs both quality control and acceptance functions for some street cut restorations. Streets' quality control and acceptance activities do not ensure that the City's street cut restoration quality standards, as depicted in Appendix B, are met.
 - The guarantee period is designed to be a compensating control; however, it is not functioning consistently.
- Right of way permits are currently applied, issued, and tracked manually by the Public Works Inspections Division, which is time consuming. Implementing an automated solution will increase the Division's efficiency and provide greater assurance that all work conducted in the right of way is being managed and tracked appropriately. Public Works Inspections has begun investigating relevant permitting systems.

Management has concurred with all recommendations made in this report. Management's response is attached to this report in Appendix A. We appreciate staff's cooperation during the audit. Please contact the City Auditor if you have any questions or need more information.

Sincerely,

Umesh Dalal, City Auditor

Introduction

The City Internal Auditor is responsible for providing: (a) an independent appraisal of City operations to ensure policies and procedures are in place and complied with, inclusive of purchasing and contracting; (b) information that is accurate and reliable; (c) assurance that assets are properly recorded and safeguarded; (d) assurance that risks are identified and minimized; and (e) assurance that resources are used economically and efficiently and that the City's objectives are being achieved.

The City Auditor's Office has completed a performance audit of the Utility Street Cuts process. We conducted this performance audit in accordance with generally accepted government auditing standards with the exception of standard 4.18 regarding documentation of audit staff's continuing professional education.¹ Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Management Responsibility

City management is responsible for ensuring that resources are managed properly and used in compliance with laws and regulations; programs are achieving their objectives; and services are being provided efficiently, effectively, and economically.

Audit Objectives, Scope, and Methodology

This report is intended to provide assurance on the City's ability to properly safeguard one of the City's largest and most valuable assets (streets) by evaluating the effectiveness of controls over utility street cuts authorized by right of way permits. Utility street cuts made as part of construction activities that do not fall under a right of way permit are not included in the scope of this audit.

Audit fieldwork was conducted during February, March, and May of 2019.² The scope of review varied depending on the procedure being performed. The following list summarizes major procedures performed during this time:

- Reviewed documentation to develop criteria including industry standards, best practices, policies and procedures;
- Developed an abbreviated process narrative to identify current control activities, which was certified by the Senior Right of Way Inspector and Streets Operations Manager, and reviewed a utility repair flowchart developed by Water Utilities staff;
- Interviewed relevant Atmos Energy staff and City staff including individuals from Public Works Inspections, the Streets Division, and the Water Utilities Department;

¹ This report was amended on February 15, 2022 to disclose this exception, the details of which were communicated to the City Council in a [Staff Report](#) publicly issued on February 11, 2022.

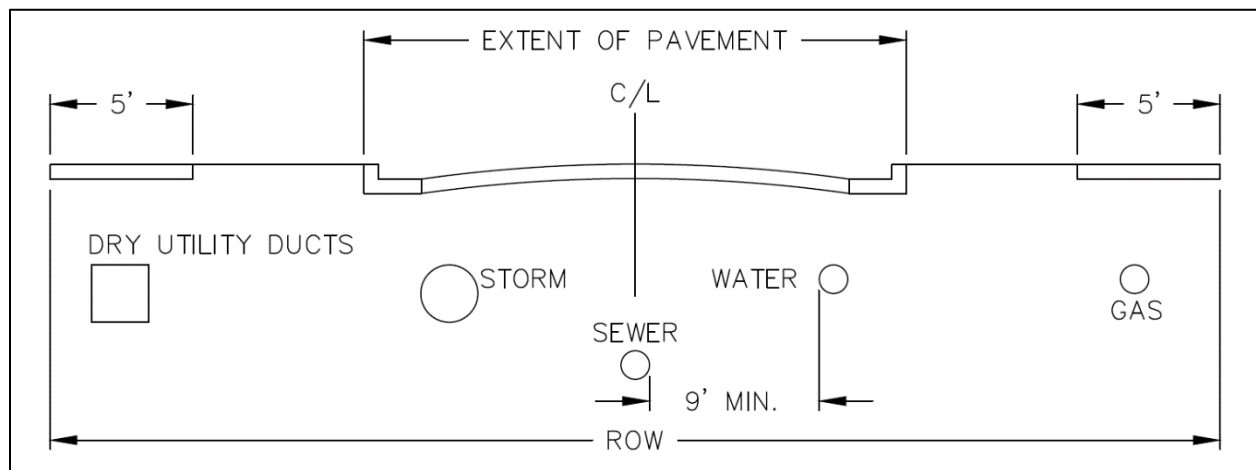
² The audit scope was expanded on May 2nd, 2019 in response to management concerns about the completeness of our audit to include the effectiveness of quality control activities performed and documented by the City's Water Utilities crews.

- Analyzed data for all right of way permits closed during 2018 using Public Works Inspection’s Right of Way Permit Database;
- Observed a randomly selected sample of 90 utility street cut patches authorized by a right of way permit and completed during 2016-2018;³
- Reviewed inspection documentation of permits closed during 2018, including activity logs and pictures, using a randomly selected statistical sample of 279 records;⁴
- Identified 2018 right of way permit locations that occurred on a street under a moratorium and reviewed relevant inspections and work order documentation;
- Reviewed associated work order documentation for 60 randomly selected right of way permits issued to Water Utilities divisions and closed during 2018.

Background Information

The City of Denton currently owns just over 4,700 lane miles of roadway and was valued around \$310 million at the end of fiscal year 2018 – making Denton’s roadway network one of its largest and most expensive City assets.⁵ In addition, the City has spent an average \$12.5 million on street maintenance and operations between fiscal years 2016 and 2018.

Utility lines are typically placed alongside or under these roads in the City’s right of way (ROW) in order to most efficiently provide services to residents (see Picture 1). This means that it is occasionally necessary for utilities to perform work in the City’s ROW, which sometimes includes excavating parts of the City’s roadway network.



Picture 1: Typical Utility Placements

Fundamentally, a street cut will always reduce the structural integrity of the pavement, even if it is restored perfectly. This is because the cut introduces weaknesses into the pavement that can accelerate the deterioration of the street. The importance of correctly completing a utility street cut restoration cannot be over emphasized. Inadequately restored cuts could allow water or

³ This sample size provides with 95% confidence that the true population (i.e. permitted ROW street cuts) is ±10% of the sample estimate.

⁴ This sample size provides with 95% confidence that the true population is ±5% of the sample estimate.

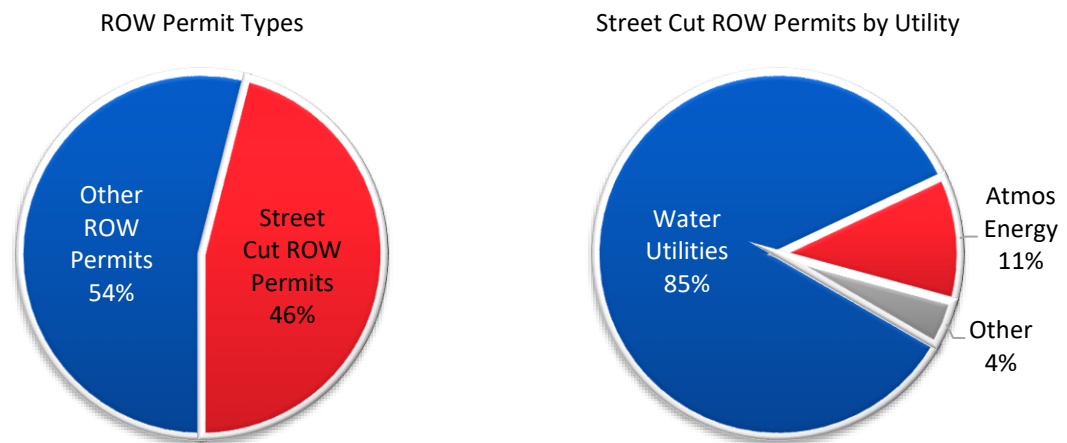
⁵ Lane miles were calculated based on square footage assuming a 10-foot lane width.

vegetation to penetrate the underlying layers of roadway, which may further compromise the substructure’s integrity.

To protect the City’s ROW assets from this damage and to limit residents’ inconvenience, the City’s Code of Ordinances requires anyone conducting work in the ROW to obtain a ROW Permit. These permits are issued by the City’s Public Works Inspections (PWI) – a division of the Capital Projects Department. In addition to reviewing and issuing permits, the Division performs and documents inspections of these worksites to ensure work is performed safely and meets the City’s standards. This does not include inspections of the facilitates installed by a utility, but does include any required restorations of roadways, curbs, sidewalks, and greenways.

While all utility maintenance and improvements conducted in the right of way are to be permitted, not all right of way work impacts the quality of the City’s roadway network. Figure 1 shows the percentage of ROW permits by type and then by utility for those permits that impact streets. The City’s Water Utilities is the most active in terms of impacting the City’s roadway network via street cuts.

Figure 1: ROW Permits by Type and Utility (2016-2018)



Glossary of Terms

The following glossary of terms has been provided as reference material:

Aggregate Crushed material, such as sand, gravel, crushed stone, or certain other crushed materials used with a hydraulic cementing medium to produce either concrete or mortar.

Backfill Material used to refill a utility trench that was excavated as part of the utility street cut process.

Compaction The process by which the density of backfill material or aggregate is increased to facilitate load bearing; without proper compaction, the life of a street cut patch will be significantly reduced.

Inspections Observations and tests performed by City inspectors designed to ensure construction work follows the City's standards.

Final Inspection Observation and testing performed by the City's right of way inspectors after the utility work and corresponding restoration has been completed. This inspection typically ensures that the worksite has been returned to a condition as good or better than before the work was conducted.

Forms Inspection Observation and testing performed by the City's right of way inspectors before the pavement surface is laid to determine if the backfill compaction and trench form conforms to the City's standards.

Safety Inspection Observation and testing performed by the City's right of way inspectors over the course of permitted work to ensure the safety of construction workers and residents affected by the construction.

Layers of Roadway Layers of material arranged within a pavement structure in order of descending load bearing capacity.

Pavement Surface The layer in contact with traffic loads, typically made of asphalt or concrete.

Base The layer immediately beneath the pavement surface, typically made out of crushed aggregate.

Subbase The layer between the base and subgrade, typically made out of crushed aggregate made of a lower quality than the base.

Loads The vehicle forces exerted on the pavement, which inflicts a certain amount of unrecoverable damage that accumulates over the life of a pavement.

Restoration Process Steps taken to structure the utility trench to meet the City's standards, fill the restructured trench with backfill, and lay asphalt or concrete pavement over the backfill material.

Right of Way The legal right, established by usage or grant, to pass along a specific route through grounds or property belonging to another; particularly in this report the right of way typically means the use of a roadway owned by the City of Denton.

Roughness Irregularities in the pavement surface that adversely affect the ride quality of a vehicle and the user including delay costs, fuel consumption, and maintenance costs.

Street Moratorium A temporary prohibition of utility construction or repair activity on a street based on recent improvements made to the street such as reconstruction.

Utility Street Cut Process of excavating the pavement and underlying layers of a roadway to perform maintenance, repairs, or construction on utility lines.

Water Utilities A department of the City of Denton which includes the Water Distribution division and the Wastewater Collections division.

What Works Well?

Throughout this report, the City's quality assurance controls over utility street cuts have been compared to the City's Code of Ordinances and pavement management best practices compiled by Pavement Interactive. Pavement Interactive is a curated information resource for the pavement community, which provides a reference on common pavement topics, methods, and practices. Pavement Interactive was developed by the Pavement Tools Consortium, a partnership between several state Department of Transportations,⁶ the Federal Highway Administration, and the University of Washington, as part of their effort to further develop and use computer-based pavement tools.

Controls over Utility Street Cuts are Well Designed

According to Pavement Interactive, there are generally three components to quality assurance⁷ consisting of: 1) quality control performed by the permittee; 2) independent assurance performed by an unrelated third-party; and 3) quality acceptance, performed by the owning agency. A well-designed quality assurance process decreases the likelihood that utility street cuts and their corresponding restoration will hasten the deterioration of streets. The auditors found the following:

Quality Control

- The City requires a right of way (ROW) permit to be pulled via a standard application process.
- The City's Engineering Services has made available standard details for City Water Utilities' trenches which are also used to govern the quality of street cut restorations (see Appendix B). The City's ROW Ordinance requires the permittee to perform their work in accordance with these standards.
- City policy currently prohibits utility construction or repair activities on streets that have been micro sealed, overlaid, or reconstruction for three, seven, and twelve years respectively.

Independent Assurance

- City Ordinance allows for density tests to be run at a reputable testing laboratory if the compacted density of any backfill is in doubt. Backfill compaction is perhaps the single most important quality aspect of a street cut restoration.

Quality Acceptance

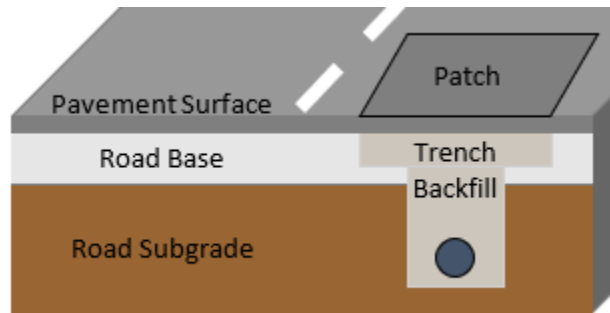
- Responsibility for restoration quality acceptance is placed with the City Engineer by Ordinance and has been delegated to the Public Works Inspections (PWI) Division. PWI's ROW inspectors are responsible for inspecting permitted work to ensure that it meets the City's standards.
 - Division policy requires all concrete and asphalt restorations to pass a Forms inspection. Forms inspections are performed before the new pavement patch is laid to allow for an inspection of trench form and the compaction of backfill just below the pavement surface.

⁶ The Texas Department of Transportation was a part of this Consortium.

⁷ Quality assurance is defined as those planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service, including continued evaluation of all activities in the process.

- All ROW permits receive a Final inspection before they are closed. Final inspections are performed after the pavement is restored to allow for an inspection of worksite condition.
- City Ordinance establishes a guarantee period of one year during which the utility may be required to perform additional restoration work due to inadequate workmanship. The guarantee period protects the City similarly to a warranty.
- Available documentation provides an adequate record of inspections that occurred.

Figure 2: Utility Street Cut Illustration.



Opportunities for Improvement

Utility street cuts occur when a utility must perform work on a service line under a road. This work typically breaks through the pavement surface and into the underlying layers of a roadway (see Figure 2). In relation to this, the City has designed controls to provide assurance that street patches are constructed according to the City's standards.⁸ The City's standards should mitigate the risk that these breaks unnecessarily weaken the roadway's structure and shorten its usable life.

Current City Standards do not Address all Aspects of Street Cut Restoration Quality

Pavement Interactive identifies three critical aspects to utility street cut restoration quality: 1) trench form, 2) compaction of backfill, and 3) pavement patch joint permeability. In addition, the City requires ride quality, or the roughness of a road, to be considered for all street improvements and all utility cut worksites to be free of debris upon completion.

What We Found?

- The City's current utility street cut restoration standard details requires benching over a linear trench, which generally results in a vertically T-shaped trench (see Figure 2), and concrete "flowable" backfill, which is a self-compacting material. These requirements conform to best practices and are being examined during PWI's Forms inspections. However, the standards do not require patch joints to be sealed as best practices suggest.
- The City's Transportation Design Criteria Manual specifies that a ride quality test (TXDOT Item 585 Surface Test Type A) should be used for short in-fill street improvements.
 - Permit documentation does not indicate that utility street cut pavement patches are being tested using the prescribed ride quality test.
- Division policy requires the permittee to restore their work site and any surrounding impacted areas to a condition equal to or better than its original condition.
 - We found evidence that this is being inspected during PWI's Final inspections.
- We observed a randomly selected sample of 90 utility street cuts during 2016-2018. Six of these cuts had begun exhibiting signs of distress (Picture 2). The cause of this distress could not be determined via observation. In addition, we identified one patch that had obvious roughness issues (Picture 3).



Picture 2: E. Prairie St. Patch



Picture 3: Bernard St. Patch

⁸ Unfortunately, a street cut will always reduce the structural integrity of a road and should be avoided as much as possible through coordination between utilities and the agency responsible for maintaining roads.

Why Does It Matter?

The City’s standard details are the main quality guidelines for the permittee’s work. Unsealed pavement joints allow water and other materials to seep under the pavement surface and damage the underlying layers – potentially decreasing the useful life of the road around the patch. While patch joints are occasionally sealed by contractors, requiring sealing via City standards will aid Public Works Inspections in protecting the roadway network from accelerated deterioration.

Recommendations:

1. Engineering Services needs to modify the City’s standard details to require pavement patch joint sealing.

Capital Projects Comments: Staff is currently implementing this recommendation in the new City of Denton Construction Specifications to be adopted by the end of this year.

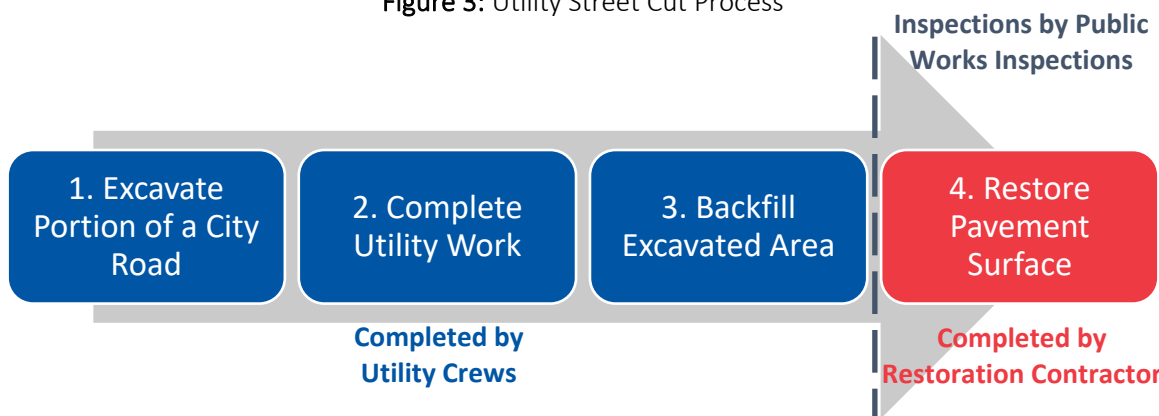
2. Engineering Services needs to develop criteria to determine when patch ride quality should be tested.

Capital Projects Comments: Staff will adopt later this summer a standard procedure for determining the level of ride quality required when assessing a patch. Staff will review other agencies and city’s requirements as a reference for the City of Denton’s standard procedure.

Dual Responsibility Complicates Quality Assurance

The utility street cut process can be simplified into four steps as illustrated in Figure 3. Throughout this process, controls should be utilized to ensure that the key quality aspects of street cut restoration (identified previously) meet the City’s standards. The City currently has four utility cut standard details: 1) Proposed Pavement Trench, 2) Unpaved Trench, 3) Existing Pavement Trench Asphalt, and 4) Existing Pavement Trench Concrete. Our review determined if controls were in place to ensure that utility street cuts authorized by right of way permits met the Existing Pavement Trench standards, as depicted in Appendix B.

Figure 3: Utility Street Cut Process



What We Found?

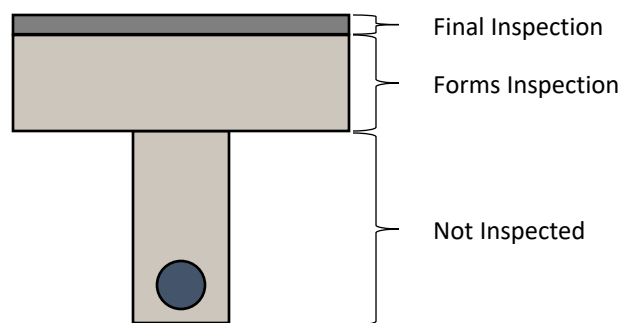
Utility Crew Work (Steps 1-3 in Figure 3)

- 96% of street cut right of way permits are pulled by the City of Denton’s Water Utilities or Atmos Energy.⁹ These entities follow a similar process when it comes to completing their repairs and backfilling the trench after identifying a maintenance or improvement need. The typical process is detailed below; however, it should be noted that materials are occasionally changed due to environmental conditions:
 - I. Request a line locate to determine if other utility lines are in the area.
 - II. Apply for and receive a right of way permit.
 - III. Excavate street materials down to the utility line to be repaired.
 - IV. Complete work on the utility line.
 - V. Backfill sand or pea gravel around the utility line based on the utility type (utility embedment).
 - VI. Backfill the utility trench with material that was originally excavated and compact in six-inch lifts using a vibratory plate compactor up to between twelve and eighteen inches under the pavement surface.
 - VII. Backfill the last twelve to eighteen inches of the trench with crushed aggregate material typically used in road construction and compact with a vibratory plate compactor.

Inspections by Public Works Inspections (Dashed Lines in Figure 3)

- Public Works Inspections perform a Forms inspection on all non-City utility ROW permits between steps three and four of Figure 3.
 - Permit documentation and inspector testimony indicate that trench form and the compaction of backfill material just below the pavement surface are observed to ensure they meet City standards (see Figure 4).

Figure 4: Utility Street Cut Inspections



- City utility ROW permits do not receive a Forms inspection from Public Works Inspections. Meaning that no independent assurance can regularly be provided that backfill and trench form meet the City’s standards, as depicted in Appendix B.

⁹ Denton Municipal Electric has also pulled right of way permits in the past, however, these do not typically affect the City’s roadway network.

- According to Water Utilities staff, their Field Services Supervisors inspect trench backfill to ensure it meets the City's standards; however, determines if the City's Proposed Pavement Trench standards are met instead of the Existing Pavement Trench standards as depicted in Appendix B.
- For asphalt repairs, a Streets Division Crew Leader assesses the trench form and backfill material before restoring the pavement surface; however, discussions with Streets and Water Utilities personnel indicate that the trench is not being assessed to ensure it meets standards (between steps 3 and 4 of Figure 3).
- City concrete patches do not receive a Forms inspections or assessment by Streets employees before a contractor lays the pavement patch.
- Public Works Inspections perform a Final inspection on all ROW permits after step four of Figure 3 to ensure the work site is restored to an equal or better condition than before work was conducted (see Figure 4).
 - Permit documentation does not indicate that utility street cut patches are being tested using the prescribed ride quality test.
 - Inspectors may request, but do not require patch joints to be sealed because it is not a City standard.
- The Guarantee Period is designed to ensure that street cut restoration workmanship is effective by inspecting patches to ensure they do not show signs of distress in the first year.
 - Currently, there is no standard procedure to inspect permits during the guarantee period, however, we did find evidence that PWI has required additional restoration work at least once as part of this requirement.

Restoration Contractor Work (Step 4 in Figure 3)

- After backfilling to the surface is completed, the utility requests that a third-party lay the new pavement surface.
 - According to Atmos crews, they hire a third-party contractor to excavate a portion of their backfill, complete a Forms inspection, fill the appropriate amount of the trench with flowable fill, and lay the pavement surface.
 - On the other hand, Water Utilities uses a third-party contractor for concrete repairs and the Street Division to complete asphalt repairs. According to Streets and Water Utilities personnel, the backfill placed by Water Utilities crews is not excavated and replaced, instead the pavement is laid on top of the backfill compacted by the crew.
- Since Water Utilities' street cuts do not receive a Forms inspection, we reviewed work order documentation including pictures and notes in the CityWorks system for 60 Water Utilities' street cuts to identify if the City's standards, as depicted in Appendix B, were met.¹⁰



Picture 4: City Utility Backfill Material

¹⁰ Work orders were identified by randomly selecting right of way permits closed during 2018 that were issued to Water Utilities' Water and Wastewater Divisions and involved asphalt or concrete restoration.

- Of the 60 permits reviewed, we found that at least half did not appear to use Existing Pavement Trench standard specified materials just under the pavement surface.
- According to Water Utilities staff, the backfill material specified in the City’s Existing Pavement standards¹¹ – specifically the flowable fill – is difficult to acquire in small amounts, especially after hours for emergency repairs. For this reason, Water Utilities’ crews typically use compacted crushed aggregate materials (see Picture 4) when acquiring flowable fill is impractical. This complies with the City’s Proposed Pavement Trench standards.

Why Does It Matter?

Pavement Interactive’s best practices require quality control and quality acceptance to be wholly segregated duties of a quality assurance process. Table 1 page summarizes the controls currently being performed to ensure utility street cut quality meets standards; the current control deficiencies exist:

- a. Water Utilities quality control activities do not ensure that the City’s street cut restoration quality standards, as depicted in Appendix B, are met.
- b. The Streets Division performs both quality control and acceptance functions for some street cut restorations. Streets’ quality control and acceptance activities do not ensure that the City’s street cut restoration quality standards, as depicted in Appendix B, are met.
- c. The guarantee period is designed to be a compensating control; however, it is not functioning consistently.

Table 1: Quality Assurance Controls over Utility Street Cuts

| Step | Criteria | Non-City Utility | City Utility | |
|-------|----------------------|---------------------|---|---------------------|
| | | | Asphalt | Concrete |
| 1 | ROW Permit | PWI Review | PWI Review | PWI Review |
| 2 | Utility Repair | Utility Crew Leader | Utility Crew Leader | Utility Crew Leader |
| 3 | Trench Form | PWI Forms | Field Svcs. Super. & Streets Assessment | Field Svcs. Super. |
| | Backfill Compaction | PWI Forms | Field Svcs. Super. & Streets Assessment | Field Svcs. Super. |
| 4 | Joints | N/A | N/A | N/A |
| | Roughness | None | None | None |
| | Cleanliness | PWI Final | PWI Final | PWI Final |
| After | Restoration Quality | Guarantee Period | Guarantee Period | Guarantee Period |
| | <i>Risk Level: *</i> | Low | Medium | Medium |

*Risk that street cut restoration will not comply with the City’ standards (see Appendix B)

| |
|----------------------------------|
| Adequate Assurance of Compliance |
| Some Assurance of Compliance |
| Little Assurance of Compliance |

These deficiencies increase the chance that utility street cuts will not be constructed to meet the City’s standards – potentially decreasing the useful life of the affected street. Specifically, the City’s

¹¹ This requirement has been in effect since at least August of 2017.

Existing Pavement Trench standards require flowable concrete backfill for at least the top foot of a utility street cut trench. This material is self-compacting, which decreases the risk that a cut will be compacted inadequately: inadequate compaction causes cracking, sinking, and ultimately a pothole. While flowable fill decreases this risk, it does not ensure pavement distresses won't occur.

It should be noted that while the manual compaction of aggregate material is riskier than the City's current Existing Pavement Trench standards, it is an appropriate practice when executed as specified in the Proposed Pavement Trench Standards. This being said, requiring external utilities to meet a different standard of quality than internal utilities creates inequity – especially given that Water Utilities is responsible for 85% of permitted street cuts. If City utilities have concerns about the existing standards, they may consult with the City's Engineering Division, who propose the standards to City Council. This report does not make any recommendation to address this situation.

During this audit, the Streets Division informed us that they are considering suspending asphalt restoration services currently provided to the City's utilities. Removing the Streets Division from the utility street cut process completely transfers inspections responsibility for quality acceptance process to Public Works Inspections, eliminating confusion and potential redundancy. In addition, quality control responsibility for internal street cuts, including restoration work, is completely transferred to the City's utilities, giving them further control over their permitted right of way work. On the other hand, the quality of roadways is ultimately the responsibility of the Streets Division and removing themselves from this process may create unintended consequences in terms of road quality.

Recommendations:

3. Public Works Inspections needs to develop a standard procedure to perform follow-up inspections on street cut restorations during the guarantee period.

Capital Projects Comments: *Staff will establish a standard procedure and schedule for follow up inspection on street patches during the guarantee period. This procedure will be established by the end of June, 2019.*

4. Water Utilities needs to require their restoration contractors to comply with the City's standards for all right of way permits. Requiring the contractor to excavate and backfill with the appropriate material would allow Water Utilities to remain flexible but still meet the City's standards.

Water Utilities Comments: *The Utility has begun requiring adherence to City standards on non-emergency work. Staff is working with engineering and inspections to determine if alternative standards are acceptable. If so, these will be noted in later revisions of the standard details.*

Public Works Inspections Division Workload Hinders Effectiveness

Over the past three years, the Division has closed over 1,000 ROW permits annually. ROW permits are typically open for about two months and receive an average of two inspections over this time. Safety inspections are performed by PWI as needed to ensure the worksite is not inadvertently endangering citizens, while Forms and Final inspections must be performed just before the pavement patch is laid and when all work is completed as described previously.

What We Found?

- During 2018, one full-time employee was dedicated to reviewing, issuing, managing, and inspecting right of way permits and their associated restoration. We found evidence that some inspections were performed by Public Construction Inspectors instead of the ROW Inspector.
- Table 2 estimates right of way permit workload based on 2018 permit documentation and assumes one inspection takes one hour. This estimated workload – based only on inspections – accounts for about 93% of dedicated ROW permit hours during 2018 (i.e. one employee at 40 hours a week for one year is 2,080 hours).

Table 2: Estimated Work Load Analysis (Permits Closed During 2018)

| Utility | Street Cut Permits | | Other ROW Permits | | Est. Productive Hours |
|----------|--------------------|----------------------------|-------------------|----------------------------|-----------------------|
| | Permits | Avg. Inspections Performed | Permits | Avg. Inspections Performed | |
| City | 438 | 1.04 | 168 | 1.23 | 662.16 |
| Non-City | 85 | 3.92 | 323 | 2.91 | 1,273.13 |
| All: | 523 | 1.50 | 491 | 2.33 | 1,935.29 |

Why Does It Matter?

Table 2 demonstrates that staff is conducting most inspections on non-City permits. However, most street restorations are completed under City utilities’ ROW permits. Essentially, significantly fewer inspections are conducted on the City’s street restorations as described previously. Without conducting inspections of paving restorations for City ROW permits, key quality aspects of most restorations cannot be assured. If restorations are not adequately completed, the street is likely to deteriorate at a much faster rate, causing the City to spend more money at an accelerated rate to repave streets.

Estimates received from Public Works Inspections project that performing Forms inspections for City Water Utilities and Denton Municipal Electric, at the current rate permitted, would add about 10 inspections per week; similarly, performing Guarantee inspections for all permits would add about 23 inspections per week. Based on this, the workload increases due to recommendations 3 and 5 would be about 1,716 inspections for a total of 3,651.

As of February 2019, Public Works Inspections has hired two additional ROW-dedicated inspectors. This will increase the available staff time for permit management and inspections from about 2,000 hours to about 6,000 hours. These additions may allow the Division to provide the same restoration inspection coverage of City ROW permits that non-City ROW permits receive. In the future, if the same restoration coverage cannot be provided even with two additional staff members, the Division should consider requesting an increase in staffing during the budget process as appropriate.

Recommendation:

5. Public Works Inspections needs to conduct a Forms inspection on all asphalt and concrete street restorations completed as part of a right of way permit, including City utilities.

Capital Projects Comments: Staff make this a requirement with the adoption of the City’s right of way ordinance for compliance on both publicly and privately funded projects.

Water Utilities Comments: Water/Wastewater staff will work with public works inspections to determine if there are ways in which we can speed up the inspection process.

Water Utilities Occasionally Makes Cuts on Streets Under a Moratorium

In the City of Denton, streets that have received certain improvements are placed under a moratorium set by the City’s Streets Division practices. In order to cut into a street, all utilities must receive a right of way (ROW) permit from the Public Works Inspections Divisions. Utilities may cut into a street to repair, replace, or improve their facilities; perform planned maintenance; or install a utility tap. If an emergency arises, utilities may conduct work before receiving a permit even if the street is under a moratorium. When this type of emergency work occurs, an emergency permit application must be retroactively submitted to Public Works Inspections.

What We Found?

- Based on our review of a sample of 279 right of way permits, we noted that about 47% were submitted via the emergency permit process – all by a Water Utilities division.
 - This practice appears to be used to expedite the permitting process for Water Utilities and does not necessarily indicate the number of water or wastewater emergency repairs that are made, though many are made for emergencies.
- However, expediting the permit process in this way increases the risk that a non-emergency utility cut will be made on a moratorium street – counter to Street’s current practices, which state: “utilities should request authorization to be able to construct in [moratorium] areas.”
 - We found that of the 1,014 right of way permits closed during 2018, about 50% involved a street cut and subsequent restoration: about 8% of these permits cut streets under a moratorium (see Table 3).
 - Based on a review of work order information available in CityWorks, we determined that 23 utility street cuts of a moratorium street were non-emergency.¹²

Table 3: Street Moratorium Analysis (2018 ROW Permits)

| Utility | Street Cut Permits | Moratorium Cuts | | Moratorium Percentage of Street Cuts |
|-------------|--------------------|-----------------|---------------|--------------------------------------|
| | | Emergency | Non-Emergency | |
| Atmos | 79 | 6 | 0 | 7.6% |
| Water | 247 | 14 | 10 | 9.7% |
| Wastewater | 184 | 0 | 13 | 7.0% |
| <i>All:</i> | <i>510</i> | <i>20</i> | <i>23</i> | <i>8.4%</i> |

Why Does It Matter?

The street cuts shown in Table 3 weakened the integrity of about \$500,000 of street maintenance and improvements completed since 2015; non-emergency cuts weakened about \$300,000 of this amount. While emergency cuts are occasionally necessary, non-emergency utility cuts on moratorium streets should be minimized as much as possible.

¹² Emergency status was based on categorization of work orders in the CityWorks system and typically involved a water or sewer tap, placement of a manhole, planned repairs, etc. It should be noted that a determination for seven permits could not be made due to documentation discrepancies. These permits were included in the non-emergency category in Table 3.

This being said, five of these non-emergency cuts were made to install water or wastewater taps, which are typically requested by utility customers to support new development. Denying these requests would hinder the effectiveness of other City services. Thus, more clearly defining what types of cuts are allowable on moratorium streets and developing a process to notify the Streets Division when these are made is desirable.

Recommendation:

6. Water Utilities needs to work with the Streets Division and Public Works Inspections to define what constitutes an emergency utility cut.

***Water Utilities Comments:** Staff will establish documented criteria for emergency utility work.*

7. Water Utilities needs to notify the Streets Division when utility cuts of moratorium streets are made. The Streets Division has a GIS map of moratorium streets that could be used as a reference for this process.

***Water Utilities Comments:** The Utility currently notifies the Streets Department when such streets are disturbed, and uses the Moratorium Streets Map for planning and decision making purposes. The Utility will work with the Streets Department to ensure appropriate staff are notified in the future.*

Restoration Plans are not Always Necessary

According to Pavement Interactive, quality control is those actions and considerations necessary to assess production and construction processes to control the level of quality being produced in the end product.

What We Found?

- The City's standard details are an adequate control on the permittee's quality processes. In addition, the Division's policy requires a Restoration Plan to be submitted if a total area greater than 50 cubic feet will be excavated.
- A review of a sample of 2018 permit documentation identified no documented restoration plans. We estimated that in accordance with the existing policy, about 46% of this sample should have had a documented Restoration Plan.

Why Does It Matter?

The City's standard details act as the main quality control aspect in the street cuts process. If the contractor performing restoration work is following the City's standards, requiring a Restoration Plan creates an unnecessary duplication of efforts and increases administrative burden. On the other hand, a Restoration Plan provides the permittee with an effective mechanism for requesting deviations from the City's standards. Deviations from standards may occasionally be warranted if the entire roadway will be reconstructed soon; however, they should be approved prior to work being conducted.

Recommendation:

8. Public Works Inspections needs to alter Division policy to require restoration plans only when deviations from the City's standards are requested to reduce administrative redundancy.

Capital Projects Comments: *This policy will be revised as recommended with the adoption of the City's standard specifications later this year.*

Right of Way Permit Fee Structure is Ineffective

According to the Government Finance Officers Association (GFOA), user fees should establish a clear relationship between the services provided and the associated cost. In order to ensure that this relationship is appropriate, the fee should be reviewed at least every 3-5 years.

What We Found?*Permit Fees*

- ROW permit fees are established per City ordinance and are calculated by multiplying the number of inspections performed by \$100. For most utilities, these fees are paid after the permit has been closed.
 - The ROW permit fees have not been updated in the past 50 years per City Ordinance.
- Based on an assessment of Division policy, ROW permits are intended to limit the amount of work being conducted in the City's ROW to facilitate quality assurance and timeliness:
 - The ROW permittees are limited to 25 open permits at any given time by City policy; however, we found that five utilities had more than 25 permits open during most of 2018. According to City staff, emergency permits are excluded from this policy, which may explain the high volume of these five utilities.
 - About 12% of 2018 permits were closed more than a week after the permit expiration date. Though this is a stated limitation, there is no clear associated penalty with violating a permit's expiration date.
- We found evidence that inspectors occasionally perform "courtesy" inspections, for which utilities are not charged.
 - We estimated that 1,933 inspections were performed during 2018 based on the right of way permit database, however, \$186,300¹³ was invoiced to utilities. It should be noted that no permittee was charged the correct amount based on the permit documentation. There may have been a slight shortfall in collection of fees.

Enforcement Methods

- The City's Right of Way Construction ordinance requires a permit applicant to deposit with the City a \$1,000 surety bond to be conditioned upon the permittee's compliance with the ordinance and the issued permit.
 - Currently, PWI does not enforce this ordinance requirement due to the administrative burden.

¹³ About 57% of this amount was reconciled against a utility's franchise agreement.

- Apart from this unenforced requirement, there are not specific methods of recourse available to the City if the conditions of the ROW ordinance or the permit are violated.

Why Does It Matter?

Permit Fees

According to the GFOA, a clear relationship between the user fee being charged and the associated service should be established. The current fee structure accounts for the number of inspections performed by City staff; however, there are additional costs that are not being included in the calculation that are detailed on the next page.

- While the ROW permit process is designed to limit the effects of damage caused by excavating a part of the City's street network, utility cuts inherently create weaknesses in the roadway network, which can shorten the useful life of a road.
- A review of ROW permitting policy indicates that the City wishes to minimize the danger and inconvenience caused to residents as much as possible in order to avoid damaging the City's reputation and provide a safe environment for residents to live and work.
 - The current fee structure of charging for each inspection rather than for the entire process may disincentivize requesting needed inspections. In addition, the structure should also focus on minimizing residents' inconvenience. Charging fees for the entire street cut process may be a more effective way of recovering the costs discussed above.

Enforcement Methods

Additionally, the City does not currently have any specific enforcement methods that can be applied if the right of way ordinance or permit is violated. Without specific recourse, the City is unable to disincentivize violating the ROW ordinance or issued permit, increasing the risk of accelerated deterioration to the City's roadway network.

Recommendations:

9. Public Works Inspections needs to adjust the right of way permit fee structure to hinge on the length of time a permit will be open. Consider requiring an additional fee to extend a permit.

Capital Projects Comments: *Staff has engaged a consultant to recommend a new permit fee structure as part of an overall assessment of all development fees.*

10. Public Works Inspections needs to reevaluate the cost of right of way permit fees periodically.

Capital Projects Comments:

11. Public Works Inspections needs to request the City Council modify the right of way ordinance to include specific recourse for non-compliance with the ordinance or the permit requirements.

Capital Projects Comments: *The current draft of the right of way ordinance provides for such recourse.*

Inspection Documentation Improvements Will Increase Effectiveness

According to Pavement Interactive, inspection documentation should include anything that might impact the construction or performance of the road.

What We Found?

Permit Management & Tracking

- During 2018, the Senior Right of Way Inspector reviewed permit applications submitted in-person or via e-mail. Issued permits are then manually documented in an EXCEL workbook (i.e. ROW Permit Database) that is maintained by the Senior Right of Way Inspector. Inspections are then scheduled based on this database.

Inspection Documentation

- For each issued permit, the ROW Inspector also maintains an individual Permit Folder that typically includes:
 - A Permit Activity Log, which documents inspections and communication with the permittee; photographs of the worksite; and supplemental permit application documents (i.e. traffic control plan, construction plans, etc.).
 - All reviewed 2018 permit documentation included a Permit Activity Log; however, over 80% of sampled permits did not have any inspection result details.
- The Division had developed a standardized Inspection Checklist for Safety, Forms, and Final inspections as of February 2019; however, they were not used during the audited period. While documenting these checklists for each inspection would be an improvement, more detailed results would be needed to allow for effective analysis of restoration performance.

Why Does It Matter?

Permit Management & Tracking

Right of way permits are currently applied, issued, and tracked manually by the Public Works Inspection Division. While this is adequate, it is also time consuming. Implementing an automated solution will increase the Division's efficiency and provide greater assurance that all work conducted in the ROW is being managed and tracked appropriately. Public Works Inspections has begun investigating permitting systems of this type. One option may be the City's already existing system, which is currently used by Development Services to manage building-related permits and inspections. Utilizing the City's current system would cost under \$10,000 and would increase intradepartmental synergy.

Inspection Documentation

Due to work load issues, inspection documentation is generally limited to the date an inspection occurred and pass or fail type results. This information is sufficient to ensure that quality acceptance controls are functioning. Nevertheless, developing and documenting detailed, standardized inspection results will allow inspectors to perform analysis on restoration performance. This change will allow the Division to more effectively identify issues with permittees, contractors, and the City's standards. Standardized inspection documentation will also aid the inspectors' supervisors in reviewing permit progress and identifying project issues as dedicated

ROW permit staff increases. Recent increases in staffing should enable the Division to accomplish this change.

Recommendations:

12. Public Works Inspections needs to issue right of way permits and document corresponding inspections in an automated permit management solution. The City's current permit management system should be investigated for usability to its full extent before a separate system is purchased.

Capital Projects Comments: Staff is currently evaluating such a system as part of a request for qualifications. Staff anticipates this system to come online by the end of the year.

13. Public Works Inspections needs to develop and implement standardized inspection documentation to test for all critical restoration criteria and allow for future analysis.

Capital Projects Comments: Staff will develop standardized inspection documentation as recommended. This will be implemented with the City's standard construction specifications.

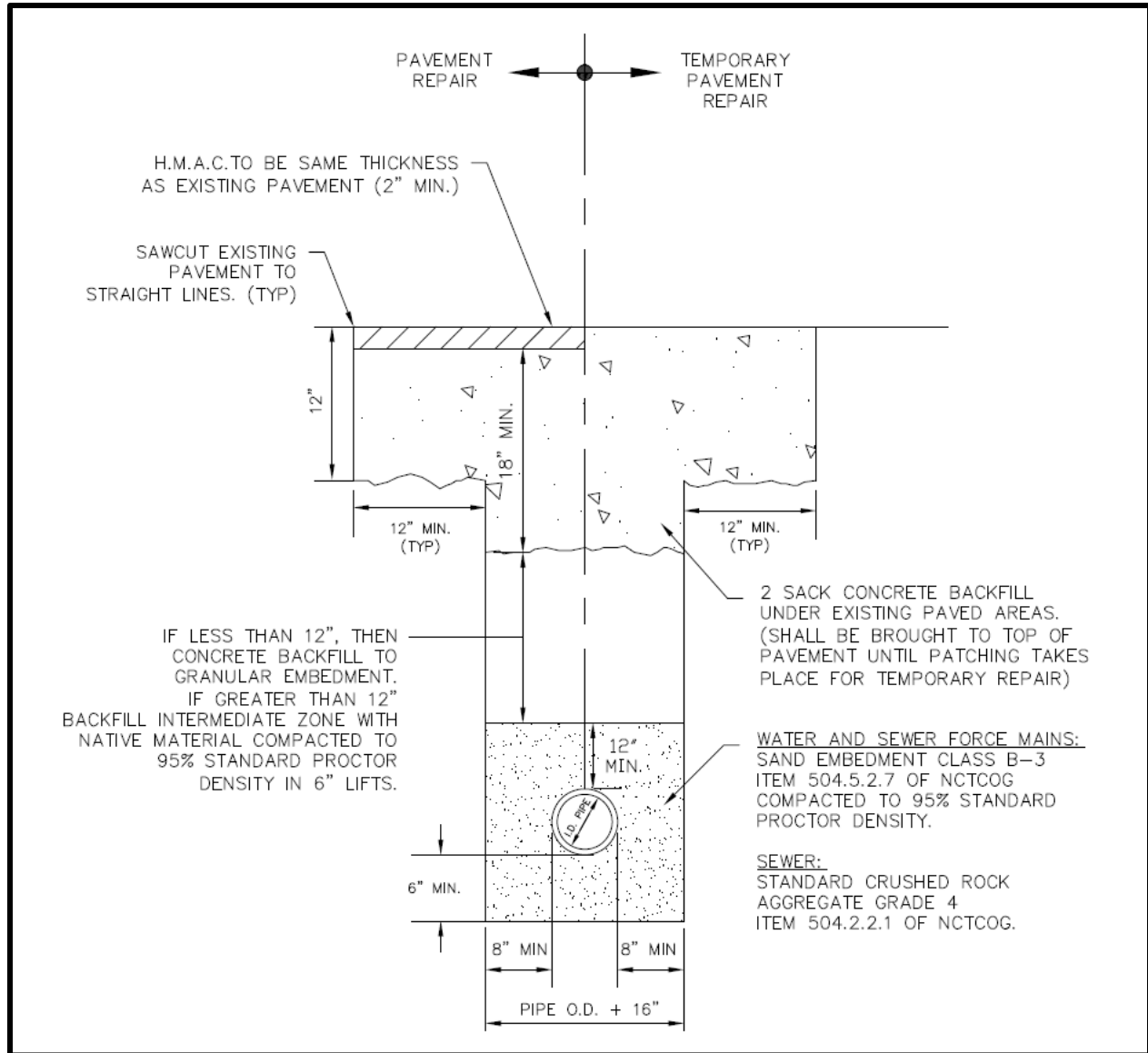
Appendix A: Management Response Summary

The following summarizes the recommendations issued throughout this report. The auditors found that staff and the Division was receptive and willing to make improvements to controls where needed. Management has provided their response to each recommendation.

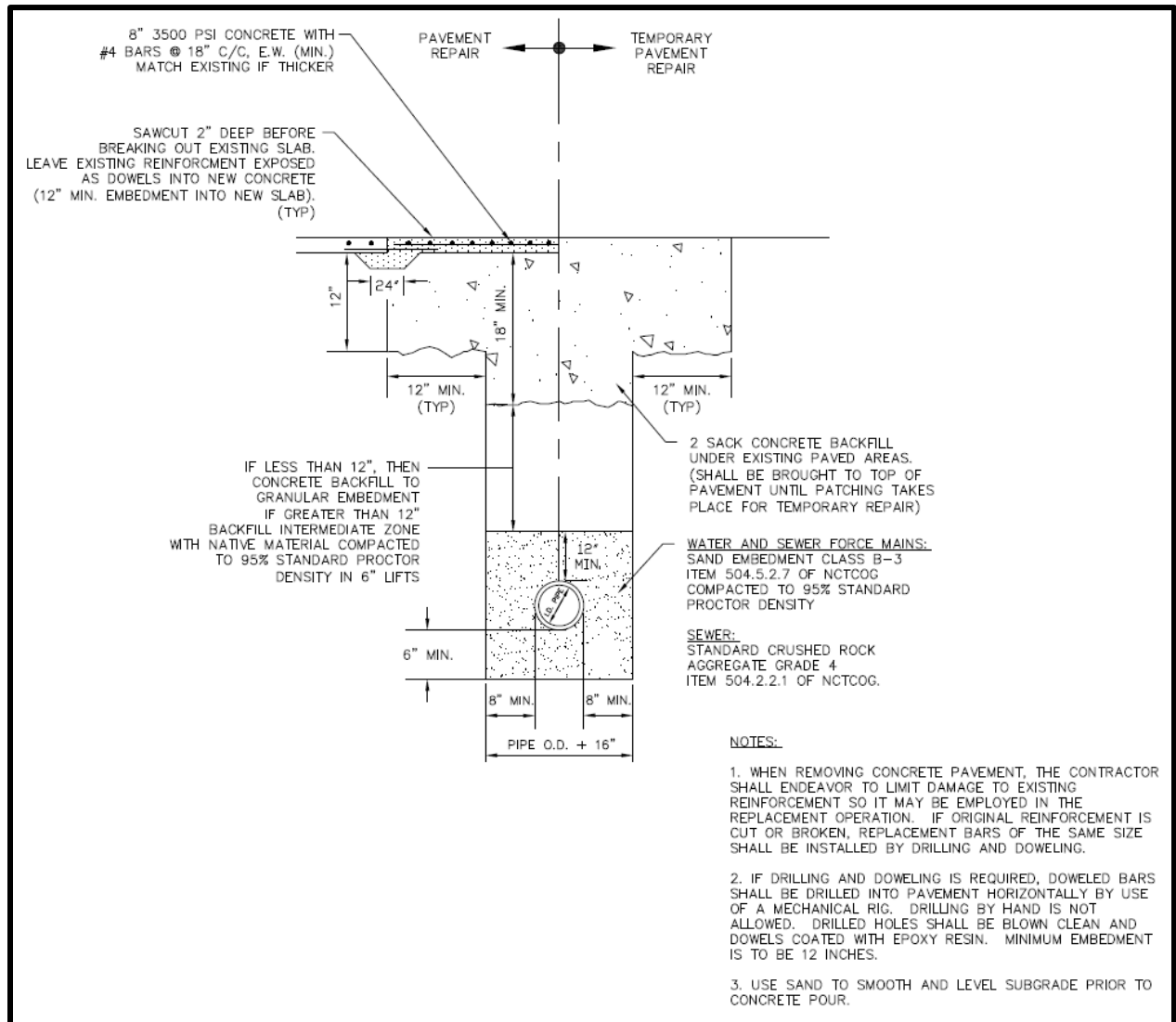
| | |
|--|--------------------------------|
| <p>1 <i>Engineering Services needs to modify the City’s standard details to require pavement patch joint sealing.</i></p> | <p>Concur</p> |
| <p>City Engineer Comments: Staff is currently implementing this recommendation in the new City of Denton Construction Specifications to be adopted by the end of this year.</p> | |
| <p>2 <i>Engineering Services needs to develop criteria to determine when patch ride quality should be tested.</i></p> | <p>Concur</p> |
| <p>City Engineer Comments: Staff will adopt later this summer a standard procedure for determining the level of ride quality required when assessing a patch. Staff will review other agencies and city’s requirements as a reference for the City of Denton’s standard procedure.</p> | |
| <p>3 <i>Public Works Inspections needs to develop a standard procedure to perform follow-up inspection on street patches during the guarantee period.</i></p> | <p>Concur</p> |
| <p>City Engineer Comments: Staff will establish a standard procedure and schedule for follow up inspection on street patches during the guarantee period. This procedure will be established by the end of June, 2019.</p> | |
| <p>4 <i>Water Utilities needs to require their restoration contractors to comply with the City’s standards for all right of way permits.</i></p> | <p>Partially Concur</p> |
| <p>Water Utilities Comments: The Utility has begun requiring adherence to City standards on non-emergency work. Staff is working with engineering and inspections to determine if alternative standards are acceptable. If so, these will be noted in later revisions of the standard details.</p> | |
| <p>5 <i>Public Works Inspections needs to conduct a Forms inspection on all asphalt and concrete street restorations completed as part of a right of way permit, including City utilities.</i></p> | <p>Concur</p> |
| <p>City Engineer Comments: Staff make this a requirement with the adoption of the City’s right of way ordinance for compliance on both publicly and privately funded projects.</p> | |
| <p>Water Utilities Comments: Water/Wastewater staff will work with public works inspections to determine if there are ways in which we can speed up the inspection process.</p> | |
| <p>6 <i>Water Utilities needs to work with the Streets Division and Public Works Inspections to define what constitutes an emergency utility cut.</i></p> | <p>Concur</p> |
| <p>Water Utilities Comments: Staff will establish documented criteria for emergency utility work.</p> | |
| <p>7 <i>Water Utilities needs to notify the Streets Division when utility cuts of moratorium streets are made.</i></p> | <p>Concur</p> |
| <p>Water Utilities Comments: The Utility currently notifies the Streets Department when such streets are disturbed, and uses the Moratorium Streets Map for planning and decision making purposes. The Utility will work with the Streets Department to ensure appropriate staff are notified in the future.</p> | |

| | | |
|---|--|---------------|
| 8 | <i>Public Works Inspections needs to alter Division policy to require restoration plans only when deviations from the City's standards are requested to reduce administrative redundancy.</i> | Concur |
| City Engineer Comments: This policy will be revised as recommended with the adoption of the City's standard specifications later this year. | | |
| 9 | <i>Public Works Inspections needs to adjust the right of way permit fee structure to hinge on the length of time a permit will be open.</i> | Concur |
| City Engineer Comments: Staff has engaged a consultant to recommend a new permit fee structure as part of an overall assessment of all development fees. | | |
| 10 | <i>Public Works Inspections needs to reevaluate the cost of right of way permit fees periodically.</i> | Concur |
| City Engineer Comments: | | |
| 11 | <i>Public Works Inspections needs to request the City Council modify the right of way ordinance to include specific recourse for non-compliance with the ordinance or the permit requirements.</i> | Concur |
| City Engineer Comments: The current draft of the right of way ordinance provides for such recourse. | | |
| 12 | <i>Public Works Inspections needs to issue right of way permits and document corresponding inspections in an automated permit management solution.</i> | Concur |
| City Engineer Comments: Staff is currently evaluating such a system as part of a request for qualifications. Staff anticipates this system to come online by the end of the year. | | |
| 13 | <i>Public Works Inspections needs to develop and implement standardized inspection documentation to test for all critical restoration criteria and allow for future analysis.</i> | Concur |
| City Engineer Comments: Staff will develop standardized inspection documentation as recommended. This will be implemented with the City's standard construction specifications. | | |

Appendix B: City of Denton Water Utilities Shared Standard Details



Picture 5: Existing Pavement Standard Details – Asphalt



Picture 6: Existing Pavement Standard Details – Concrete