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Scheduling utility conflicts for a highway reconstruction project

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Scheduling utility conflicts for a highway reconstruction project

by

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CHAPTER 1: INTRODUCTION

1.1 UTILITY MANAGEMENT IN CONSTRUCTION

Determining the location and potential conflicts of utilities before construction begins is a necessary component to the overall on time, on schedule success of a project. A successful project start relies on several groups or agencies that play a large role in the potential relocation of site utilities. In the case of Interstate-235 (I-235), which involved the Iowa Department of Transportation (Iowa DOT) along with the Federal Highway Administration (FHWA), area utility companies, the City of Des Moines and its surrounding suburbs, communication and coordination were especially vital.

This thesis will present the I-235 reconstruction project as a case study in utility management. It was the goal of all concerned to ensure sufficient time for the relocation of utilities in order to meet important scheduling dates and limit resulting cost implications should the timeline for the project fail. From this highway project and related research, recommendations for utility management in similar projects types will be made.

1.2 CAUSES AND COSTS OF UTILITY RELATED DELAYS

Research was performed in 1997 to 1998 by the General Accounting Office of the Transportation Research Board related to utility relocation delays. A survey was sent out to transportation agencies of various states to identify causes of utility delays. The responses identified the following as causes of delays [6]:

- Short time frames for planning and designing of projects
- Lack of resources by utility companies to perform relocation work
- Poor timing
- Poor coordination

These causes though can be characterized by two different causations or sources of delays [18]:

- Unknown utility locations.
- Late utility removal.

The research performed by the General Accounting Office of the Transportation Research Board also identified common practices of contractors and transportation agencies in situations where there are utility delays. They include the following [6]:

- 44 states extended project completion dates for contractors that were affected by utility relocation delays.
- 30 states compensated contractors for increased costs that resulted from utility delays.
- Some contractors that were affected by delays chose not to seek compensation because of the time required to fill out paperwork.
- Some contractors that were affected by delays assumed complete financial responsibility for increased costs from utility delays.

So, not only did utility related delays negatively affect contractors working on the project, but state agencies as well.

Utility delays may have serious cost implications. In 1984, delays caused by utilities were the basis for as much as $120 million in highway contract claims. On an average year though, twenty percent of claims are related to utilities [18]. Often the parties involved want to determine the group or individual responsible for the overrun in cost. Claims might be made by the contractor against the state or utility owner. The policies of state highway agencies regarding utility-related delay claims differ. Some states rarely recognize utility claims as reimbursable and only in certain situations, such as whether the utility was known to exist at the time of the contract. Therefore, if the utility is shown on the plans and even if the utility was relocated late, the state will not recognize the claim by the contractor because contractually the contractor assumes risk.

State policies regarding reimbursable delays may differ, but one characteristic remains the same; even if there's a question of whether the cost of the delay is the obligation of the state, utility company or contractor, the delay is still a cost of the system [18].

Utility relocations, defined as the adjustment of a utility facility as required by a road project, can be very extensive in highway projects [11]. In one such case where the highway contract was approximately $16 million, over $10 million worth of utility relocations were performed. Therefore, due to the scale of the project for the $426 million reconstruction of I-235, the cost of utility relocations and the possible delays could be substantial. At the same time, this project provides an opportunity to study the process of utility relocations and organizational behavior of a DOT and

utility companies. From this study of I-235 and additional research, areas of improvement might then be determined related to the utility process [18].

1.3 I-235 BACKGROUND

I-235 was first constructed in the 1960's. At that time, the average vehicles per day estimate was 27,000, whereas the current estimate is 86,700. The 13.8 mile long roadway, which was expected to meet the needs of the area until 1978, is a long overdue project. The reconstruction, which began in 2002, is estimated to take 5 years.

Construction design standards have changed since the time the road was designed. So, not only will the construction update standards and decrease the amount of traffic congestion, it will also replace structures or roads that are deteriorating. For example, the original pavement had a 30 to 40 year life expectancy. The original bridges had a 14.5 foot clearance. This clearance is too low for present day traffic on the interstate, further risking damage to structures and creating a safety hazard. The existing interchanges are also too close together. Thus, the interstate cannot handle the traffic demands of the future, let alone handle the present.

The reconstruction will include the following improvements [14]:

- Replacement of low clearance bridges
- Lengthening of entrance and exit ramps
- Additional lanes in some areas (three to four lanes in each direction)
- Visual improvements with lighting, painting, and landscaping

- Meeting all current design standards

Appendix A shows the schedule of projects for the I-235 reconstruction project.

1.4 IOWA STATE UNIVERSITY SCHEDULING TEAM'S ROLE

The Iowa State University (ISU) scheduling team's role was to aid the Iowa Department of Transportation with the scheduling of the multi-year reconstruction project. This included establishing a project schedule for the highway corridor, material resource loading and creating templates for various activities, such as bridge and grade and pave projects. The ISU scheduling team also aided in utility coordination, which is the focus of this thesis.

1.5 THESIS OBJECTIVES AND ORGANIZATION

The objectives of this thesis will be to describe the role of utilities in the construction process and to detail how an organization such as the DOT can include them in a project's schedule. The goal of this thesis is to not only educate on the technical aspects of utilities but also the social components of utility and team coordination. To achieve this, the author will use the I-235 reconstruction project as a case study.

Chapter 2 of the paper will be a discussion of the stages that utilities cycle through. These stages will be detailed to provide background on the many utility related issues that are involved in a highway construction project, such as the I-235 project. In addition to the stages, problems in the current utility system and the importance of finding solutions will be discussed. Guidelines that may aid in

preventing conflicts will be mentioned, along with progressive utility policies or practices of various state highway agencies.

Chapter 3 will describe how utilities were incorporated into the project schedule of I-235. This will involve mentioning the types of utilities encountered in the project and the typical utility-handling process of a highway agency, primarily the Iowa DOT.

Chapter 4 will detail other products that assisted the Iowa DOT in its utility coordination.

Lastly, recommendations for agencies that plan on managing projects such as the I-235 reconstruction will be summarized. Also suggested will be areas for future research.

CHAPTER 2:

UTILITY CYCLE

2.1 SUMMARY OF UTILITY CYCLE

To effectively schedule utilities, one must understand the process that utilities go through. To do this, individuals must understand the three main stages—identification, design and construction. Also important to recognize are the two keys of moving successfully through the cycle—communication and coordination. Figure 1 shows a diagram of the utility process and how the stages relate to each other.

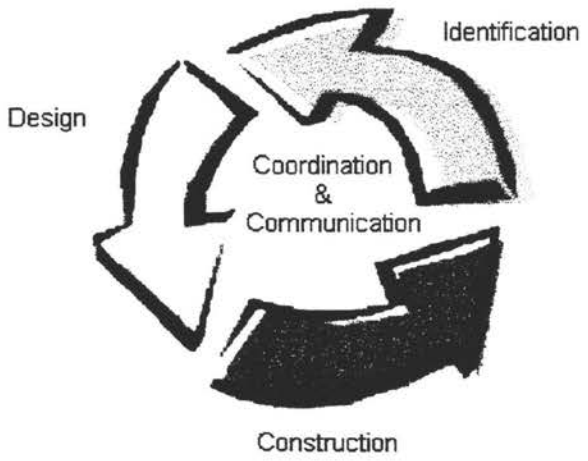


Figure 1: Utility Cycle

The initial state of the process is identification. This involves determining the characteristics of utilities in the area of a project. The characteristics include type, location, size, and condition of the utility.

The utility type refers to the specific service provided: water, gas (natural gas or pipeline), storm or sanitary sewer, electric (transmission or distribution), cable,

telephone, or other types. Different types of utilities tend to differ in the network of services, the web of facilities that oftentimes are hidden underground. The extensiveness of the web may determine the flexibility of abandoning or relocating the existing facility.

Location describes the vertical and horizontal placement of the utility. Finding the location of just one point on an underground facility would be insufficient because the alignment and slope of the utility may change.

Size is important because it might determine whether the utility is to be abandoned or relocated. If the facility were large for the type of resource it is carrying, size would also be connected to the cost. For example, a 20-inch water main would be more expensive to replace than a 4-inch line.

Physical condition includes the amount of deterioration and age of the utility. This would be important to the DOT and utility company because if a water main, built in 1910 and with three past breaks, is located under a road that is going to be replaced, it would be an ideal time to replace the facility. In this case, replacing the problem utility at this time would be taking advantage of the closed road as well as reducing the probability of having to tear up the new pavement because of a leak in the aged facility.

Condition might also apply to whether the utility meets current design standards. One example of this is a water main crossing the interstate not having the required encasement that was previously not required.

The components of the identification phase are to involve communication and coordination between the DOT, utility companies, and city or any other agency that would have interest.

Also, during the identification phase, use of technology is becoming more and more important. The benefits of using subsurface utility engineering (SUE) in this phase are increasing as the technology improves. SUE will be discussed in further detail in a later section.

The design phase is comprised of the design of the highway project as well as the design of the utility. The DOT utility engineers along with other DOT employees, such as design engineers, work to identify possible conflicts with existing utilities. The DOT employees also work with utility companies to mitigate costly design for the utilities. Utility owners also do their part by providing information on utilities in the project area.

As mentioned before, the construction segment includes both actual work on the utility and the work on the roadway project. Sometimes, the work will be simultaneous.

In reality, the stages in the utility cycle aren't always three distinct and separate phases. Overlap occurs, especially in a multi-year, multi-project undertaking as in the I-235 reconstruction.

Communication and coordination keeps the cycle in motion. For example, once it has been decided that relocation is necessary, this communication involves letting the utility companies know when the facility needs to be removed.

Coordination might also include two utility companies that each need to relocate a facility working with each other to integrate their schedules.

2.2 IDENTIFICATION

One of the risks of not knowing placement of utilities is damage to the utility. This can then affect the safety of the construction workers and the public. Other risks involve time or money. They include the following [3]:

- Redesign costs
- Higher construction bids
- Change orders
- Extra work orders
- Construction claims
- Higher insurance costs
- Higher financing costs
- Project delays
- Detours
- Bad publicity

Identification for a utility is important because some DOT utility engineers believe that the primary cause for construction delays is failure on the part of the utility company to properly locate their facilities. [18].

Utility information may be obtained from old project plans (as designed), utility records (as designed and as-built), maintenance records, repair records, visual observation, and field surveys.

Information on the location is also obtained by using the one-call system. It will briefly be described here in the identification stage, but will be detailed in the construction section [3].

The one-call service notifies the companies that have utilities in the area of the excavation. The utility company usually then will have the utilities located and marked before the dig occurs.

A large inadequacy of the current process of utility marking is that the depth is not provided. So, if an area is marked showing a gas line is there, the contractor does not know how far below grade the gas line is located. Such incomplete information could frustrate a contractor into not using the one-call service regardless of contractual requirements, thereby breaking down the cooperative efforts needed by all parties to properly locate and protect existing utilities [21].

As mentioned above, sometimes the depth of the utility is unknown from the information that gives utility locations. Potholing may then be done to find the elevation of the underground line. Utilities that are certain to be in conflict then have to be abandoned or relocated, depending on if the facility's system can sustain service without it.

Potholing is a type of vacuum excavation. It is used to determine the location of known utilities. In this process, a 0.3 to 0.5 meter diameter hole is created. The purpose is to determine the position and depth of an underground utility. If this is done over pavement, a hole is created with a rotary core drill. Further excavation is done with compressed air or high-pressure water jets. This type of intrusive locating

method will not usually damage the utility. Rather, the holes that are created can be easily repaired [21].

Other types of utility location involve soil boring and hand excavation, although boring involves risk of damaging the utility if done too close to the utility. The holes created from the excavation could then be used with types of non-destructive locating methods. Hand excavation is common especially when near utilities. Even then, one needs to be careful about damaging unprotected utility cables.

As mentioned, there are non-destructive methods of locating a utility. Most involve some type of a signal or wave that is sent through the ground. The signal or wave responds to the utility differently than the ground. An instrument measures the different responses. Some methods involve seismic waves, which are ground vibrations, or ground penetrating radar, which involves radio frequency signals. Other types measure magnetic, electric, gravitational, or temperature field variations.

Signal variations can be measured from aboveground through the air. This method tends to be lower in cost than other forms. Surface methods also don't involve excavation. These methods, though, may get some interference from traffic.

Once the measurements have been collected, the data has to be analyzed. The position and type of utilities are then inferred based upon the analysis.

These methods have some inadequacies. They are not able to locate all types of utilities, and they don't work in all types of soils. Many are affected by nearby interference and oftentimes cannot locate beyond certain depths. Lastly, the costs may exceed what companies or public agencies are willing to pay [21].

Typical surface locating methods make horizontal locates within 24 inches of their marking. Vertical locations are not given. Using potholes as a part of subsurface utility engineering (SUE), horizontal locates are given within 0.5 feet and vertical locates are done within 0.05 feet [21].

The FHWA defines SUE as a division of utility engineering that involves managing risks related to the following [11]:

- Utility mapping at appropriate quality levels
- Utility coordination
- Utility relocation design
- Utility condition assessment
- Communication of utility data to concerned parties
- Utility relocation cost estimates
- Implementation of utility accommodation policies

SUE is a process that identifies and maps underground utilities. This process ensures an accurate and detailed collection of information for existing utilities exists before the letting.

SUE involves three main concepts [21]:

- Designation
- Location
- Data management

Designation is using investigative methods to find utilities and determine their horizontal position. The designation might show more than one utility in the area. In this case, the location stage would be done to find exactly where the utilities are

located. The concept of location involves using non-destructive equipment at critical points to find horizontal and vertical positions that are accurate and precise. Data management is the stage where designers use information from the designation and location steps to determine options for a project. This allows the designers to plan ahead and eliminate conflicts before they arise.

SUE has a number of benefits, especially to the scheduling process. It decreases the number of utility relocations, damages due to cut utilities, and conflicts during construction.

These benefits of having information collected in the early stages then result in reduced bids, fewer construction delays, decrease in contractor claims or change orders, and a reduction in redesign costs.

An overall cost savings of 10%-15% when using SUE is typical. The greatest cost decrease is in the area of utility relocation. With this process, utility relocations have the possibility of being eliminated by doing only small design changes. Cost overruns, primarily due to delays, decrease project cost by about 5%. Construction, engineering, and administrative costs also decrease project costs by about 2%, 0.5%, and 2%, respectively, with using SUE [21].

Identification of utilities has its costs. These costs for identification, though, should be viewed as a small price to pay for costs incurred in the planning stage to prevent serious cost overruns in the future. Typical costs from 1998 for utility services are the following:

- Per location, up to $50 for one-call notification and locates
- Per location, $150-$500 for SUE

- $0.20 to $2 per foot for utility designation service (this might include researching records, painting markings, doing traffic control, field sketches, surveying and CADD, involving a professional engineer)

The stage of identification is not without its problems. There are several improvements that could be made for the process of locating. For example, after placement, the utilities could be marked better to be located easier in the future. Utility materials could also be made so that they are located easier by current methods. Also, advances in the locating methods themselves could be made [21].

2.3 DESIGN

2.3.1 Design of Project

Design of a construction project is usually based on existing records of utilities. These records though are oftentimes out of date, inadequate, incomplete, or simply incorrect. There are several reasons for the status of records being this way. The utility design drawings might have been used for the record on the utility location. Also, some as-builts are incorrect because of human error. In addition to this, as-builts might never have been made after a project was completed. Another explanation is that the utility companies might have utilities in the same area as others. Each company has their own records, and they may have never been completely compiled. Even if they were, some records might be incomplete or lost.

In the design process, designers have really no other choice but to rely on the records they have. It is also during the design or construction phase of the project that the locations are marked under the one-call system. If the designers are aware

the records are incomplete, they oftentimes put a disclaimer in the project plans. It might include something like the following [16, p. 111]:

> "The utilities shown on these plans were taken from the records of utility companies. The actual location of utility lines and other features may be different. It is the responsibility of the contractor to identify, verify, and safely locate all utilities and features for this project at the time of construction."

A prudent design will balance the cost of relocation and that of adjusting the design in order to allow a potential utility conflict to remain in place [6].

2.3.2 Design of Utilities

The design stage also involves the design of utility facilities. When designing utilities, several aspects should be considered [11]:

- Demand estimates for present and future needs
- ROW availability
- Considerations of safety
- Policies of utility companies for design
- Physical obstructions
- Characteristics of the utility system

The American Association of State Highway and Transportation Officials (AASHTO) suggests several guidelines when planning location of utilities. It recommends the utilities be placed so that relocation or adjustment at a later time is

minimized. Also suggested is that the utility be placed to allow for servicing with minimum interference to highway traffic. ASSHTO also provides the recommendation that longitudinal utilities be placed close to the ROW line with uniform alignment. Lastly, utility facilities that cross the road should be perpendicular to the alignment of the highway.

When a utility crosses a highway, it has two possibilities for design--crossing underground or attached to a structure. If the utility is attached to a bridge, it is usually in a conduit or pipe that is in the bridge or suspended from a bridge deck. If the utility crosses a highway underground, it usually is encased in a steel pipe. The pipe would then normally span the highway plus the embankment, following cover requirements [11].

2.4 CONSTRUCTION

2.4.1 Construction of Project

Utilities are a very important part of a project. Conflicts that arise during construction with existing utilities can cause project delays and cost increases. Not only might the conflicts cause an increase in change orders but also claims for delays [13].

A utility is allowed to be in the same area of a project without the utility being considered a conflict to the construction. This occurs when both the utility and project can coexist and be worked on at the same time. If the utility is a conflict, the item might be tied with the contract of the bridge, grading, paving, or retaining wall project. It would then be within the scope of the contractor's contract to perform the

utility work. . Utility relocation and construction work can be concurrent; for example, the utility owner can relocate while the contractor has a certain area open or closed off to traffic. If they can't occur concurrently, the other option is to narrow the construction window of both projects to fit both within the scheduled construction period for the year [20].

As mentioned in the identification stage, a one-call system is used to locate utilities in an area of construction. One-call services provide a single point of contact for contractors. They provide information on which utilities are located in the area to be excavated. This type of system is mandated in many areas of the country [21].

In Iowa, the one-call system is Iowa One Call (IOC). It was created in 1980 by companies that are now known as Qwest and Mid American Energy Company. The system only became mandatory by state law for all owners of underground utilities after January 1, 1993. The service provides a contact for anyone, ranging from contractors to homeowners, to call before excavating to have utilities located and marked.

The IOC though does not actually own any utilities. It also doesn't do the locating. Rather, requests for locations are directed at the IOC. Figure 2 details how a request to one-call is processed. These requests are then sent to the companies that have utilities in the area. The utilities then go out to the area to mark their utilities. This does not include privately installed lines. The cost of the service is paid by the members of the IOC and is completely free to those doing the excavating [16].

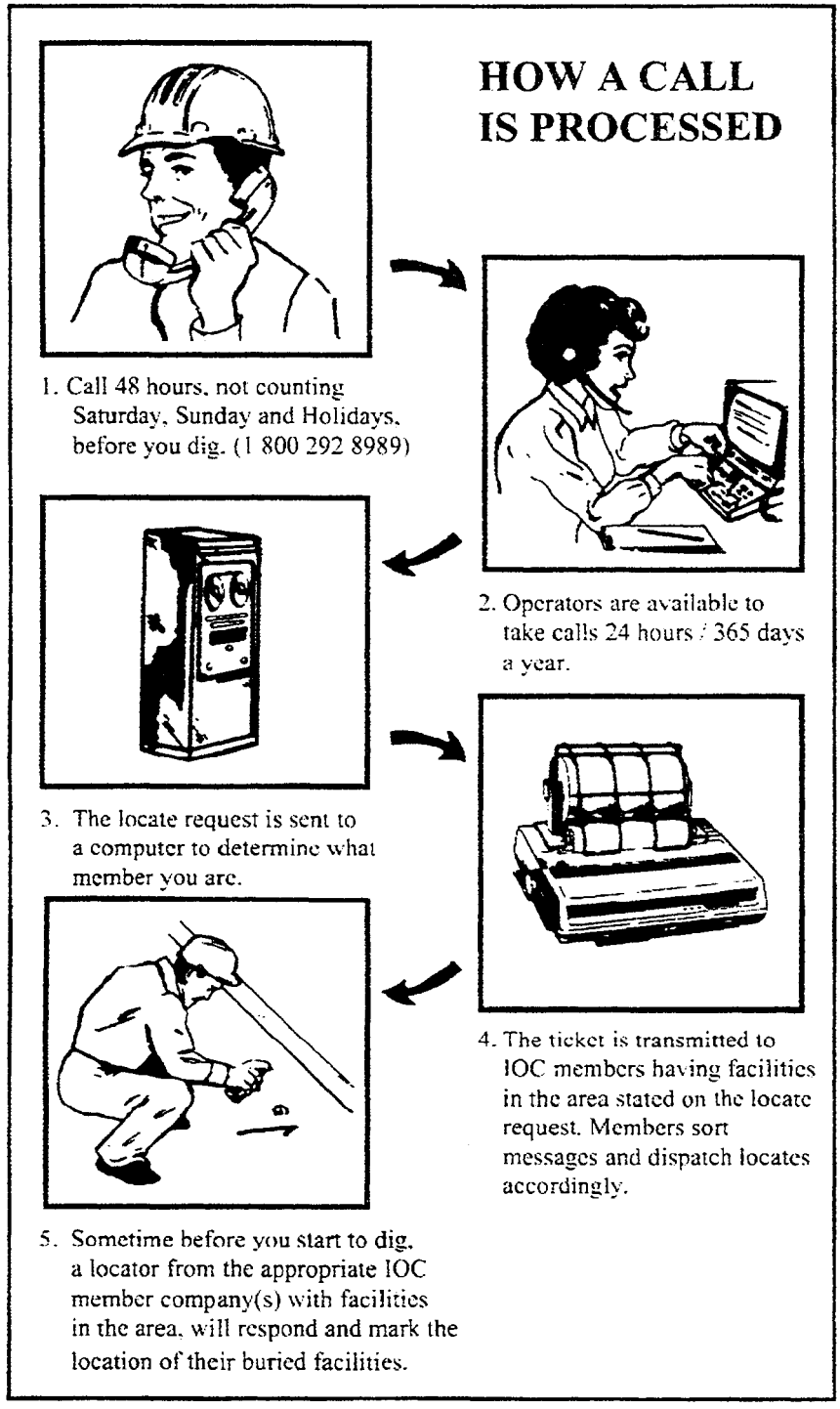


Figure 2: One-call System of Processing a Call for a Locate [16]

Excavators are encouraged to call the service at least 48 hours before performing work, though the Iowa service is available 24 hours a day, 7 days a week [16].

There are several benefits of using a one-call system. They include the following [11]:

- Prevents damage of underground facilities
- Reduces amount of money spent on repairs
- Decreases outages of customer service
- Prevents damage to life or property
- Reduces downtime of excavation
- Promotes utility coordination
- Aids excavators in regulation compliance
- Establishes a watch over excavations that may be unauthorized

Along with the benefits of a one-call, there are several problems with the system. For example, not all utility companies are participants in the system. Also, if a utility that exists in the area is not shown on the plans as being there, that company will not be notified by one-call. The locate on that utility will therefore not take place [21].

Also, one-call and utility companies might have problems responding to a request to identify or locate a utility in time with respect to the start of actual construction. Lastly, even when the utilities are located and marked, hits of a utility do occur, sometimes due to mislocation. For example in 1995, 56% of the damage

for gas pipeline hits occurred when one-call was used. Of this percentage, 25% of the hits occurred due to mislocation.

Even with using one-call, conflicts in construction still occur. At the time a conflict appears in construction though, it might be unknown whether it was due to an incorrect marking of a utility or another reason [21].

It is because of the above reasons, that there is a common belief that all utility conflicts can't be avoided even with planning and using one-call. Many feel that change orders and delays caused by utilities are inevitable [13].

2.4.2 Construction of Utility

When performing utility work, there are three types of construction situations possible. First, there is no highway project involved. Second, the utility relocation is done prior to the roadwork. Third, the utility relocation occurs during the road construction [11].

If a utility needs to be relocated before construction, utility companies shouldn't be made to wait until a highway project contract is awarded. Rather, the DOT should allow the utilities to complete work as soon as the highway design is finished. Though if there is a change in the design after the relocation is completed yet before the contract is awarded, the DOT would need to reimburse the utility company for the second relocation [18].

When utilities are relocated, the staging varies depending on the type of facility. If the utility is a line of power poles, the poles are moved depending on the priority of pole location. The power line is moved and the pole is topped [11].

Some poles though might be joint use poles. This means that poles are owned by one company, but this company allows other companies to use the poles. Oftentimes, power and telephone companies joint use poles, meaning that the power and telephone lines are placed on the same poles. If this occurs, the companies need to work together to relocate their facilities. So in some cases, after the power is moved, the other utilities would move their lines to the new set of poles.

Other utilities are located underground and the process varies from aboveground facilities. If a utility is buried, a new facility is placed and put into service. Only then is the old cable typically abandoned [11].

2.5 COORDINATION AND COMMUNICATION

2.5.1 Importance of Coordination and Communication

According to a National Cooperative Highway Research Program study [4], a leading cause of delays for highway construction projects are utility related issues. An article from the Federal Highway Administration credits early and frequent coordination, cooperation and communication between state DOT's and utility companies for more efficient and appropriate relocation tasks.

As Ed Garcia, a senior transmission engineer for Florida Power and Light said, "We need to work together. We need a lot of cooperation and coordination and to make sure that our goal is to have a good project at a reasonable cost in a timely manner."

James Neal, a relocation coordinator, also agrees with stressing cooperation and coordination. He believes it is especially key at a certain point in a project. "I'd

like to see more of an effort placed on inviting utilities to participate on the front end stage of a development project. Typically we get in at what's known as the 90 percent point. By then, the corridors and infrastructure have already been defined" [4, p. 2]

One way of establishing an atmosphere of coordination and communication is through setting up meetings with all groups involved. "It's important to set up meetings with utilities throughout for planning and design process, so we can avoid conflicts," said Melinda Peters from the Maryland State Highway Administration. A utility manager from the South Carolina DOT also believes in the importance of meeting with involved parties, "We schedule at least weekly meetings with utility companies and contractors to make sure that everyone is singing off the same page of the song book" [4, p. 3].

Overall, an effective coordination between utility owners and agencies involves the following tasks [2]:

- When possible, plan construction away from high risk utilities.
- Before construction begins, characterize exact nature of utility conflict.
- Get utility companies involved very early in a project.
- Coordinate utility relocations and easements.
- Create true as-builts for utility construction and relocations.
- Make designers' plans available for utility location.

2.5.2 Coordination and Communication in Early Planning Stages

When utility companies and agencies do not coordinate and plan jointly, there might then be insufficient time to perform the design of a utility relocation. This would result in a utility relocation delay. A delay in the utility relocation could change the project schedule. Another effect of lack of planning might be late changes in the plans or errors and omissions in the project plans [11].

The engineer should meet with utility companies to review utility information. Updates to the records of a highway project should be made and the companies should also provide input. This is different than what frequently happens now where utility companies aren't asked to give input until relocation or construction is required.

In addition to meetings with designer engineers, the owner should also review utility conflicts with potential bidders at a preconstruction meeting. At this time, active and abandoned utilities would be identified. Other information reviewed might include utility conditions and compositions, depths or elevations, size, horizontal location and soil conditions around utilities. Presently for a lot of projects, all this information is rarely provided. If it is, the information isn't likely very detailed [2].

Sometimes, conferences may occur before a utility relocation that involves the utility owner, the highway agency, the contractor, and possibly other utility owners in the area. The conferences allow the relocation schedules to be reviewed and coordinated with the schedules of the other parties. There also may have been location or scheduling conflicts between utilities. [11].

The I-235 project has had meetings that have aided in coordination and communication. One type of meeting that has occurred and continues to take place deals with specific utilities and the I-235 reconstruction project. Periodically, each utility meets with the I-235 utility coordination team. They look at the projects for the next couple of years, with emphasis on the upcoming year. Any cable, pole, line, or main belonging to that utility is looked at in the area of the project. A representative from the Office of Design is also at these meetings to add input on the details of the design.

If a utility is out of the work area, it is usually not considered a conflict. If the utility is in the work area, it has to be looked at closer. Underground lines may not be in conflict if deep enough according to policy. Design can give information on the amount of cut or fill to the grade to determine this.

Another type of coordination meeting for I-235 focuses more on the present. Every Wednesday since the construction on I-235 began, meetings have been held with major contractors (primarily bridge, grade and pave, and large utility projects). Each meeting usually begins with utility issues. At this time, the contractors bring up problems, conflicts, or questions with utilities that they have encountered. For example, a grade and pave contractor might want to know when a certain electric pole will be moved. The meetings were set up to be able to answer this kind of question. During the first few months of the meetings, representatives from the gas, electric, phone, and water companies were usually in attendance. As the meetings continued, only the representative from the water company continued to attend.

Questions for the other utilities would occasionally arise, but could not be answered due to the absence of the corresponding utility representative.

It is unknown whether the representatives stopped attending because they were too busy or whether these meetings were viewed as non-beneficial. As a result of the absences, utility conflicts no longer seemed to be resolved in these meetings even though utility conflicts continued to be brought up.

Another type of meeting that occurs in the Des Moines area involving utility coordination is one that includes a mixture of the following: telephone and cable (Qwest, AT&T, MCI WorldCom, Mediacom), water (Des Moines Water Works), electric and gas (Mid American Energy), city and counties (Polk County, Cities of Des Moines, West Des Moines, Pleasant Hill, Clive, Urbandale, Johnston), and highway agencies (Iowa DOT). These meetings are of a more informal nature, occurring for lunch at a local cafeteria.

The coordination meetings have been taking place for approximately 25 years. Once a month from February to September, the representatives meet over lunch and discuss upcoming projects. This author interviewed one representative from the city of Des Moines, who stated that he felt the meetings held in early spring were the most important. This is due to the construction not yet having begun or the construction is in the early stages where he felt that utility conflicts that might cause delay could still be avoided. Participants in the meetings also provide a summary of projects that are current or upcoming for their organization. The information is then provided to participants in a booklet [5].

On a rail transit system project in the Dublin, Ireland area, coordination became very necessary. Due to the large amount of excavation, before any work could begin, the work area had to be cleared of most existing utilities. The utility owners coordinated their work to minimize conflicts and disruption to the public. Utilities created a Joint Utilities Group, which met regularly to coordinate work sequencing and technical requirements. The group was made up of all major utilities on the route of the train. Each of the utilities assigned project managers to represent them on the Joint Utilities Group.

In this case, it was especially crucial that the utilities coordinated together, because in the many cases work on one utility was dependent on one or more other utilities [10].

In the state of Florida, a group of utility owners and representatives from public agencies have formed a similar utility committee. This committee though was not established for a specific project as was the case for the Joint Utilities Group in Dublin. Rather, the Florida Utility Coordinating Committee's goal is to "promote the effective and equitable co-existence of utilities to create a successful working relationship among and between utilities and other entities through **coordination**, **cooperation**, and **communication**" [6, p. 15].

The committee also participates with transportation and other governmental agencies in the development of utility policies, procedures, and accepted practices [6].

2.5.3 Within Same Agency or Organization

Coordination and communication should also occur between members of the same organization or company. Even if the utility companies and public agencies are working well together, if the employees of the public agency aren't communicating, the project could still be delayed and go over budget.

The Iowa State University scheduling team itself was not immune to this situation. One positive change involving the coordination and communication of the Iowa State University scheduling team was when the team members began working more as a group. Before this, the team members each had their own area of specialization: bridges and grade and pave, utilities, production rate studies, and computer scheduling. The members only occasionally worked together on work items. The result of this was team members who knew their own specialties well, but weren't aware of the others' range of knowledge.

This over independence actually became detrimental to the team. Team members were making assumptions on another's specialty. When the assumptions were incorrect, it led to mistakes in calculations or conclusions. Though more time is spent in group meetings or working with another member, time is ultimately saved by not having to correct the mistakes or send a work item over to another member for checking and then to record the corrections.

Besides the time inefficiency of over self-reliance and lack of communication, there is another downside, one that occurred to the Iowa State University research team and the Iowa DOT. Team turnover negatively effected both organizations. For the Iowa State University scheduling team, the size of the team ranged from two to

seven students. Being a multiyear project, students graduated during the course of the project. As mentioned before, each student had his/her area of specialty. As each student graduated, most of the individual's knowledge went with the student. The remaining students didn't have the knowledge of the student that left, but they also were unaware of the complete scope of the knowledge of the departed students. They also had no knowledge of the information they had the potential to access from their fellow students.

This dependency on a member who would not be a member of the team one to two years later was detrimental. The documentation of a student's work was primarily placed in a file cabinet. This information remained virtually unnoticed until the office was reorganized and cleaned. Due to lack of documentation and communication as well as over-specialization, team turnover greatly affected the continuity of the Iowa State University team. New students were brought into the project to fill the holes, but the transfer of information didn't occur to the level needed.

This type of situation also occurred for the Iowa DOT utility section as well. For the first couple of years of the I-235 project, there was only one individual focusing on the utilities, a utility engineer. The engineer was responsible for identifying potential conflicts, coming up with solutions for the conflicts, and meeting with representatives of utility companies. The engineer also developed a system of archiving that involved a spreadsheet and a Word document. He also recorded some information on scrolls showing the project's plans. The engineer though

received a large amount of information from various individuals at the DOT and utility companies, of which not everything was documented.

In this type of situation where one person is in charge of such a large task, it was difficult to keep a record of all the information coming into the office. This employee became incredibly valuable due to the fact there was so much important information stored in his head.

Then when the utility engineer was offered a transfer to another area of the DOT, the agency or organization knew the transition would be difficult. Another employee began training with the utility engineer to take over the position. This employee though also took a position elsewhere. The DOT was then left with a situation of two employees leaving the utility engineer position.

The situation at the DOT is similar to what the Iowa State University team encountered. Losing a very valuable team member when there is very little knowledge overlap affects the success of a project. The DOT changed the set-up of the utility division for the I-235 project from one person focusing on utilities to two engineers and a technician.

At times, relying on one person might be efficient, but when that person leaves the position whatever efficiency was gained will be lost several times over again. The Iowa DOT's new organization for the utility section resembles the scheme that the Iowa State University team has adopted. It involves working together, communicating with each other, recognizing the knowledge of the other team members and sharing information.

Team turnover is a reality any organization must face. Team turnover is a significant factor for the success of a project. The negative effects of this factor will not completely disappear, to do so is virtually impossible, but effectively working as a team and establishing a clear method of documenting information can reduce its impact.

Another item that may have affected the communication is that the designers worked in a separate office from the construction and utility sections. Though with telephone, fax or email, communication is possible, there is a benefit of being able to walk down the hall and discuss an issue face to face. Some issues might involve a question of something shown on a plan or scroll that is difficult to communicate any other way besides in person.

Overall, the organization of the Iowa State University team and the Iowa DOT seems to have improved. The question though is whether what was learned about teamwork and accessibility will be passed down and its importance retained.

2.6 RECOMMENDATIONS FOR IMPROVEMENT IN THE UTILITY CYCLE

2.6.1 AASHTO's Guidelines and Best Practices for Utilities

AASHTO Highway Subcommittee on ROW and Utilities [1] has established a set of guidelines for highway issues involving utilities. They recommend for agencies to:

- Use currently available technology to the greatest extent possible

- Encourage frequent coordination and communication with local governmental agencies to reduce delivery time, reduce costs, improve quality in the utility process
- Encourage frequent coordination and communication with utility companies to reduce delivery time, reduce costs, improve quality in the utility process
- Improve contract, internal project development and training process to expedite utility relocation

These guidelines will be discussed giving AASHTO's recommendations for best practices and examples of the practices in use.

One type of available technology today is the aforementioned SUE. AASHTO recommends this technology to be used when there are underground utilities in the area of the project and when accurate and detailed data is needed for the design. Not only does this technology have support from AASHTO, the FHWA also recommends its usage. Some state agencies have also adopted the technology. The Virginia DOT, for example, has been using this technology since 1984. The agency actually uses SUE on almost every highway project. Many other states are using technology extensively and others are developing SUE implementation programs [1].

Another use of technology that would aid in solving incorrect archiving of locations for new utility projects is requiring utility companies to certify as-builts. Utility companies would then have a way of being held accountable for the accuracy of information they recorded after a utility project is complete. These as-builts could

then be put into a CADD system that would be easily transferred electronically to state and local agencies from the utility companies. So, accurate as-builts with a combination of a common CADD system would be incredibly beneficial for future highway construction projects.

Advances in technology though can't solve all the utility problems that arise in a highway project. Many problems are due to how people communicate and interact. AASHTO recommends frequent coordination and communication. This coordination involves not only coordination between the DOT and utility companies, but among the transportation agencies as well. The coordination among the entities also is in part dependent on the communication that occurs.

AASHTO recommends several methods of encouraging coordination to highway agencies. One method involves meeting with utility companies and exchanging information. The information exchanged might be a long-range construction schedule or a list of projected letting dates. This would allow a discussion on the possible impact of construction on the utilities. From this, if potential conflicts are identified, either the utility company could start planning for relocations or the highway designers may be able to accommodate the design to the existing facilities. The meetings between highway agencies and utility companies might be scheduled on a monthly, quarterly, or annual basis. The meetings would also provide an opportunity for discussion on other highway and utility issues. These might include ROW issues, permit policies, and reimbursement. A utility coordination committee might then evolve from attendees of the meetings [1].

Highway agencies should also be interested in being informed of the projects planned by utility companies for the upcoming years. This way if construction from both sides might conflict with each other, the situation can be resolved before it becomes a problem. This might also allow for the projects to be combined, thus minimizing cost and inconvenience to the public.

AASHTO stresses the importance of long-range coordination. Long-range planning will help both utilities companies and highway agencies. The utility companies will be able to respond better and the highway agency will be able to develop a better design and construction plan by identifying potential conflicts early [1].

The DOT's of Florida and Montana practice a form of the recommended coordination between highway agencies and utility companies. Both states provide a five-year long-range project schedule to utility companies. Florida also is using the internet to keep utility companies current on the plan.

AASHTO also recommends that utility companies receive preliminary design plans as soon as possible from the DOT so that the companies can plan their resources for relocation. The relocations though shouldn't be performed until a letting date has been decided. The Missouri DOT, for example, gives design plans in MicroStation to utility companies, reducing the time to develop utility relocation plans. This also may help the DOT maintain a more accurate record of utilities through data transfer from the utility company to the transportation agency [1].

Florida has developed a system of keeping utility companies informed. The DOT sends notice of planned projects to the utility owner and provides design plans

at 30, 60, and 90% completion. Utility companies are also notified every month of the planned project schedule, giving a notice of approximately 18 months. In addition to this, the five-year long-range schedule is given to utility companies twice a year.

AASHTO recommends utility owner involvement in the design stage if there is expected to be major relocations. This may involve monthly meetings and on-site meetings. Just as the Iowa DOT is doing for the I-235 project, the DOT should meet with utility companies individually to discuss possible relocations. As the guidelines state, "early involvement can decrease the cost and impact of projects by identifying conflicts that can be avoided" [1, p. A-47].

Early involvement in the design phase is also recommended so that utility owners may have time to settle any ROW issues that may arise with relocations. The utility may be able to fit within the DOT ROW and construction limits. If not, the facilities will have to find another area to relocate, possibly further down the corridor or beyond DOT ROW. Iowa is one state in which the DOT tries to establish ROW at least eight meters beyond the limits of construction so that utilities may relocate in this area [1].

Utility companies are recommended to attend preconstruction meetings. Also as necessary, meetings should be held during construction with contractors and utility companies, as stressed in the coordination section of this thesis. The preconstruction meetings are of special importance for it is during this time that the utility owner can become familiar with the contract and project manager from the DOT. It is also important that the utility relocation plans be finalized and the

relocation schedule be confirmed. Also, if the construction and relocation are to occur simultaneously, traffic control and other site preparations need to be coordinated [1].

2.6.2 Practices of Other DOT's

Other state DOT's have developed progressive systems involving utility coordination. The state of Minnesota has a highly organized utility section. Its DOT seems to have realized the impact utilities can have on a project. The DOT has developed several flowcharts showing the steps the agency should follow when utilities are involved. The flowcharts are shown in Appendix B. Also utilized by the agency to facilitate communication are a set of form letters to notify or request information from utility companies. The three form letters are in Appendix C.

Another state that has developed a method to encourage coordination and communication between highway agencies and utility companies is the Kansas DOT. The organization has developed online forms with which it can collect or request information from utility companies. This method works to take away a barrier, that of ease of collecting information, to aid in the smooth cycle of utility work. The three online forms used in various stages of the utility process are in Appendix D.

2.6.3 Importance of Utility Coordinator

Figure 3 shows the ideal and real utility and highway system as suggested by Laube. In the idealized system all three members, the utility company, highway

agency and the contractor, openly and frequently communicate with each other. In reality though, the network functions more like the system on the right with deficiencies, especially in the stream of communication. The three deficiencies are the following [18]:

- The utility company doesn't complete much work between the DOT authorization to start work and the contract being awarded to the contractor.
- The highway agency focuses on a chain of approval.
- The lack of communication that exists between the contractor and the utility company.

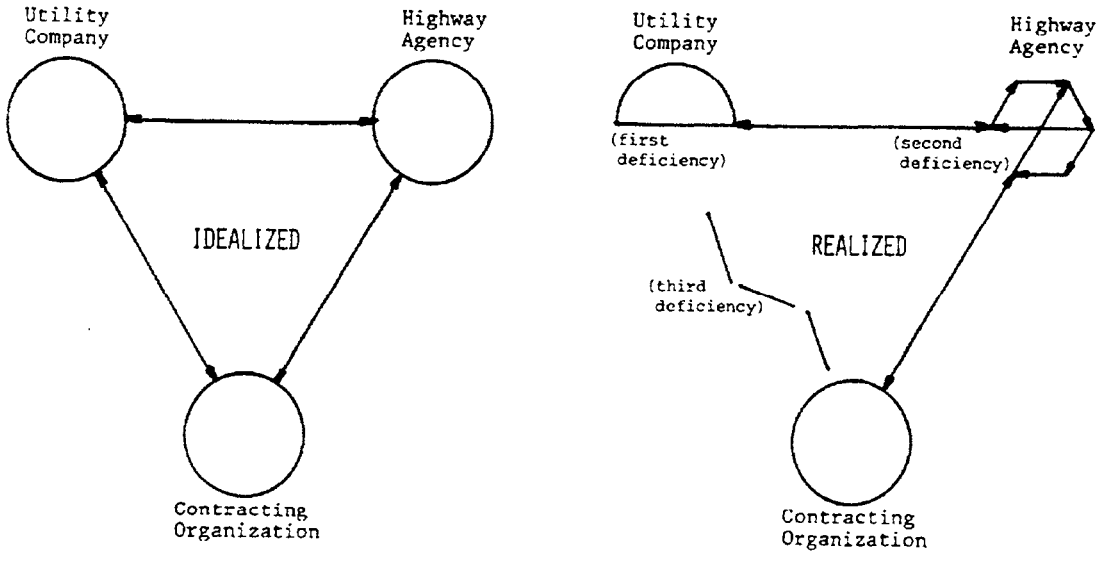


Figure 3: Diagrams Showing the Highway and Utility System [18]

Laube suggests that a utility coordinator working for the highway agency would help in eliminating the deficiencies in the network.

Items of concern that may occur oftentimes have to do with a utility company not acting fast enough. The utility company may not have enough people on their staff. They realize the solution will take longer than the DOT has time for. This then causes the DOT or the utility company to find temporary solutions before solving the original problem. Some utility companies take a reactive rather than proactive approach [20]. Some utilities wait until the last minute before they start their work unless someone coordinates the utility relocations prior to construction. That is why a utility coordinator and communication are important to the process and why it is money well spent ahead of the construction in order to save costly delays and frustration during construction.

Not only was the importance of a utility coordinator realized during the course of the I-235 reconstruction project, but the idea of a utility coordinating team became valued. Through the course of the project, the DOT has been with a utility coordinator, without a utility coordinator, and with a utility coordinator and a supporting team. Since utilities involve such a large amount of coordination and communication, one person having all the responsibilities of the job was not practical. Rather a support staff aiding a utility coordinator with his/her tasks helps to overcome the deficiencies of Laube's network as well as overcoming other organizational deficiencies within the same agency.

CHAPTER 3:

INCORPORATING UTILITIES INTO THE SCHEDULE

3.1 OVERALL

To effectively schedule utilities, conflicts with utilities should be recognized and solved. The definition of conflict is in the sense of a physical interference during construction or to the design of the project.

In the corridor that contains I-235, there are numerous utility crossings and utilities running longitudinal to the interstate. Some of these facilities have a potential to be a conflict in terms of design and construction. If a road is being lowered, an underground utility might be in the area of cut. This utility would then be relocated or abandoned. It is possible that a utility might be attached to an overpass that is going to be rebuilt. This utility would also have to be relocated. Other utilities would be in conflict to the actual construction activities. A situation where this would occur is if there were overhead electric lines that would be a conflict in construction for safety reasons.

The question of abandonment or relocation is based upon whether the facilities service can be sustained if the segment is removed. Some utilities have such a large web of facilities that there will be no effect to the service if removed. Other utilities have a small number of facilities and the service is dependent on every line.

Either type of utility though must be recognized as a potential for conflict. Both types can delay construction. This is important to avoid, especially for this project. The I-235 reconstruction consists of many different projects that will be let throughout the next five years. For projects in the future to begin on schedule, projects that are currently going on must be completed on schedule.

Some of the scheduling decisions are based on minimizing the inconvenience to the public. In general, adjacent interchanges (unless carrying one-way traffic) are not to be closed at the same time. Projects are also scheduled for financial reasons with only so much funding available in a fiscal year. Other decisions are based upon engineering. For example, for an area that has a large fill, time is needed in the schedule to allow for the earth to settle before permanent paving is applied to avoid rapid deterioration.

3.2 DOT PROCESS

3.2.1 Utility Accommodation Manuals

Departments of Transportation establish policies to provide an organizational structure for the agency. The policies establish rules for those with which the DOT does business. Some of the policies are related to utilities. Some DOT's have specifically developed utility accommodation manuals to detail utility related policies.

The Florida DOT has a utilities accommodation manual. The manual established a relationship in which the state and utility owners each have their own responsibilities. The utility owners are asked to inform the DOT of locations of existing and proposed facilities within the area of the proposed construction project.

The DOT then has the responsibility of informing the utility owners of future transportation projects. Overall, the purpose of the manual is to establish a framework that prevents expensive construction delays [18].

Based off of its policy and practices, the Florida DOT assigns the following responsibilities to the DOT:

- Provide a five year plan with probable dates of construction
- Contact utilities in the corridor of proposed construction
- Notify utilities of hearing for corridor projects
- Send preliminary plans to utilities
- Consider design changes recommended by utilities to reduce cost of relocation, regardless of whether costs are reimbursable or not
- Include utility companies in preconstruction meetings

Utility companies also have their own responsibilities according to the policy of the Florida DOT. They include [18]:

- Review with the DOT plans for new utilities or major changes to existing facilities
- Supply maps of utility network
- Supply information on utility structures
- Cooperate with the DOT and its committees
- Review preliminary DOT plans promptly

The policies are only as good as the enforcement of them. The Florida DOT, even with its progressive utility policy, has had problems in the past with the policy not being carried out. The problems were blamed on personnel changes. New

employees often do not have the same experience and do not realize the importance of coordinating utility relocation and construction.

Other accommodation policies go beyond just establishing guidelines for doing business with the DOT. For example, the utility accommodation policy of the Texas DOT is helpful in that it contains forms for various agreements [18].

The Iowa DOT has its own utility polices. The accommodation policy of the Iowa DOT was used as a reference for this paper. Its guidelines will be detailed in the following sections pertaining to the process of utility work Also, the process utility work goes through will be detailed, primarily for a typical case with the Iowa DOT. In addition to this though, procedures of other states or agencies will be mentioned to widen the scope and thus applicability of this research.

3.2.2 Definition of Utility

The Iowa DOT defines a utility as "a system supplying water, gas, power or communications; a storm sewer, sanitary sewer, drainage tile or other system for transmitting liquids; a pipeline system; or like service systems. This definition includes traffic signals and street and intersection lighting systems" [15, p. 3].

3.2.3 Notification

A utility company is typically notified by the Iowa DOT one to two years in advance of a project. Utility companies are informed of the letting as soon as possible. This notification involves the scope of the specific project and its letting date.

A representative from the DOT works with the representatives from the utility companies. They typically review projects for the upcoming two years. The representative from the Iowa DOT stresses the importance maintaining constant communication with the utility company during this time.

An actual utility conflict doesn't occur though until the plans are completed by the DOT. For example, storm sewer conflicts are usually not known until shortly before the letting (when the phrase of conflict is mentioned, this refers to the utility lying in the path of construction). If an extensive planning phase is implemented, though the potential for conflicts arising decreases [20].

3.2.4 Control of Utility

Some utilities are public and others are privately owned. Oftentimes, who owns the utility then determines or controls certain aspects of the utility. These aspects might involve the following: design issues, alignment, letting date and utility construction completion. Control may also mean who is in charge of the design or whether the DOT is the entity in charge of telling a consultant what to do and when to do it.

The issue of control is important in that utility companies have their own system and level of design and construction. Each company uses this record of their design as a way of keeping track of the utility. If a utility project is let, there will be a full design process. If the utility's own workers do the project, it is usually because the scale of the project is smaller.

3.2.5 Right of Way (ROW)

Iowa DOT defines ROW as "the land for a public highway, street or road, including the entire area between the property lines" [15 p. 3].

Black's Law Dictionary defines right of way as "only an easement and grantee acquires right to a reasonable usual enjoyment there of with owner of soil retaining rights and benefits of ownership consistent with the easement." In other words, ROW is the right of an entity to pass over the land of another [19, p. 1]

Knowing how much ROW will be involved goes to the initial concept of the design. This would incorporate the concepts of size, type, and flexibility of the utility. If ROW is required is another issue. ROW concerns who has the use of the land. If a private utility is in a public right of way, then the utility owners and possibly the DOT are there at their own risk. Oftentimes, utilities are located on public ROW. Then if the construction requires that the utility be moved, the utility must move ahead of the construction at its own cost. This work is usually independent of the contractor's work. Therefore, it is very important that ROW be determined prior to lettings or soon enough for utilities to be relocated. If this does not occur, the utility owner is at risk for a delay claim from the contractor and the I-235 reconstruction project is at risk of delay [20].

Utilities need a section of land to develop a corridor, which will contain the pipes, cables or wires. To use this land, utilities companies need to acquire right of ways from private or public sources. This ROW might be acquired through buying the land [19]. If an owner is unwilling to sell, both parties must enter into good faith negotiation. Negotiation occurs after the owner is approached regarding sale or

granting an easement [20]. An easement means that a property owner grants permission to the utility company to place its facilities on the property. The right of way might also be a license from a holder of an easement to the utility company. It is possible that when relocating or establishing a new utility, a utility company might set up hundreds of agreements with public and private landowners [19].

Easements for utilities are the most common course for facilities on private property, and condemnation is not usually necessary. Rather, condemnation is usually reserved for actual acquisitions of land needed for publicly owned utility projects or for construction projects themselves. The Iowa DOT doesn't have a lot of authority to buy land very quickly. Property owners have protected rights, and because of this the process of condemnation can take awhile [20].

For DOT utility right of ways, many areas are involved in acquisition, such as engineering and surveying, title and appraisal, public utility laws, and issues such as zoning and the environment [19].

According to the Iowa DOT policy, for utilities on DOT right of way, the utility owner is responsible for the design of the utility. The DOT will then review and approve before the utility can be placed.

For a utility to be on right of way, the utility company must first receive formal permission. The permission is obtained through a utility accommodation permit issued by the DOT. The utility owner must also receive a permit if it wants to adjust, improve, relocate or replace an existing utility [15].

3.2.6 Permits

The purpose of the permit system is to ensure the safety of the public and construction personnel, control impact on traffic, and to document the location of the utilities as a way of locating the utilities in the future [15].

Utility accommodation is the initial installation of utilities along or across ROW. For this to occur, a permit has been issued allowing use and occupancy for the utility to be in the ROW of the DOT.

Typically permits are required for additions to existing utilities, installing new facilities in the ROW, or changes in the voltage or pressure of existing utilities. Permits are a way for the intent of work in the ROW to be recorded. They describe the nature and extent of planned utility work. Permits also allow a way to coordinate the use of space and establish a record of facilities. Permits provide a means of giving formal approval and holding the party placing the utility to be responsible for the work.

Permits though aren't required for all work performed on a utility. The following are types of work that don't require a permit [11]:

- Routine maintenance
- Service connections that don't cross lanes of traffic
- Aerial service connections that don't need additional structures for support in the ROW
- Additions or changes to wires on poles that already exist

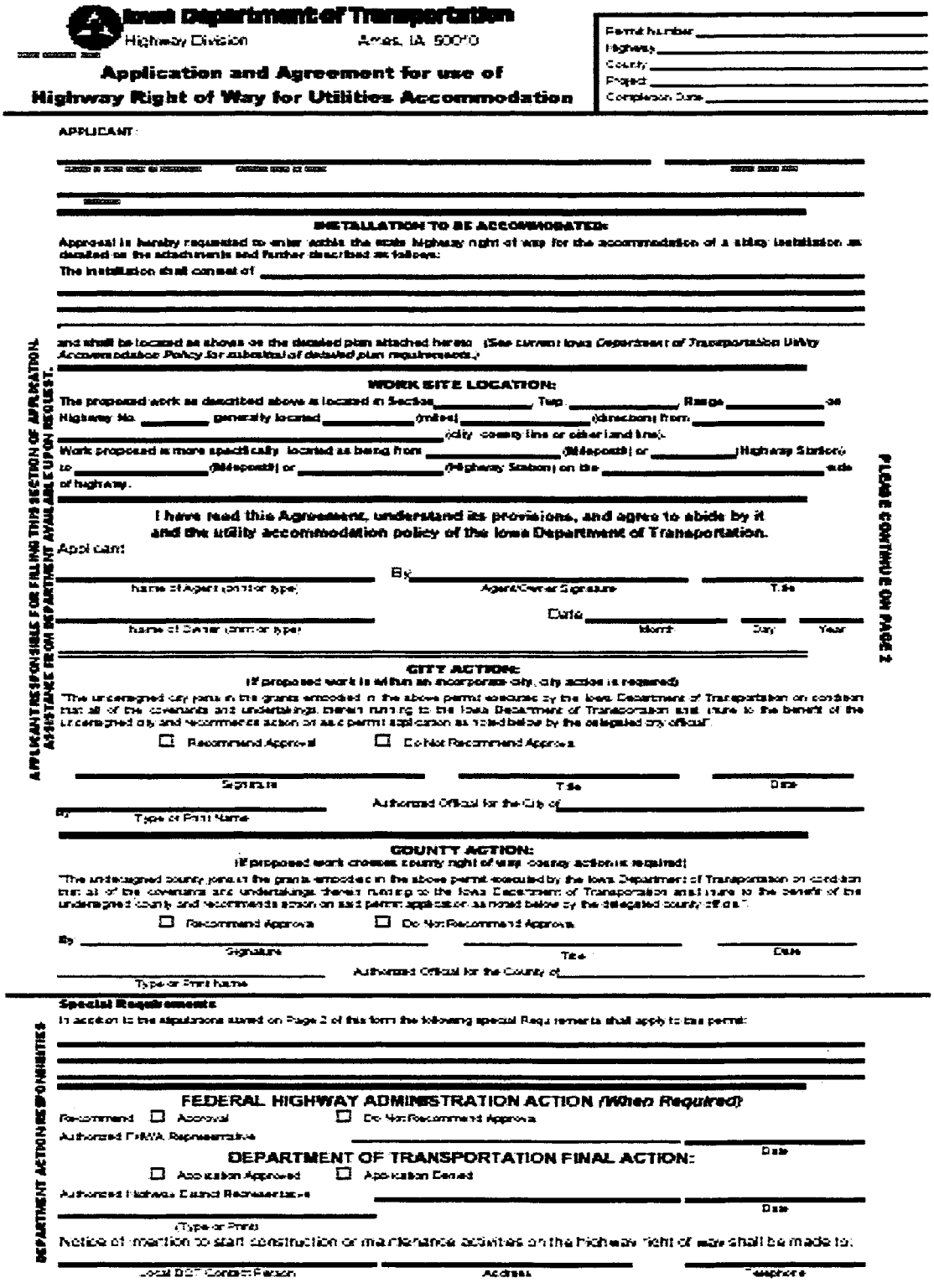
- Additions of utilities to conduits or encasements that wouldn't change the type or operating conditions of existing facility and that wouldn't disturb the surface of ground

The permit process begins by the permit application being submitted. Figure 4 shows a permit application for the Iowa DOT. The application is then reviewed by a permit administrator. The permit contains information on the following: installation, the work site location (general according to location to highway, city, or county and specifically to milepost or station). Also, attached to the permit is a detailed plan [11].

The plans that are to be attached to a permit application must show [15]:

- Location of utility by section, range, town, milepost, highway station
- Highway centerline and row limits
- Location of utility to nearest foot at each point where utility changes alignment. These are to be measured from centerline of highway for non-freeway installations and ROW fence on freeway installations
- Construction details, such as depth, type of materials to be used, operating pressures or voltages, vertical and horizontal clearances, and a traffic control plan

Appendix E shows an example of a completed permit application. The attachments vary depending on the type of utility.



Iowa Department of Transportation
Highway Division — Ames, IA 50010

Application and Agreement for use of Highway Right of Way for Utilities Accommodation

Permit Number
Highway
County
Project
Completion Date

APPLICANT:

INSTALLATION TO BE ACCOMMODATED:

Approval is hereby requested to enter onto the state highway right of way for the accommodation of a utility installation as detailed on the attachments and further described as follows:

The installation shall consist of

and shall be located as shown on the detailed plan attached hereto. (See current Iowa Department of Transportation Utility Accommodation Policy for submittal of detailed plan requirements.)

WORK SITE LOCATION:

The proposed work as described above is located in Section, Twp, Range, on Highway No. generally located (miles) (direction) from (city - county line or other land line).

Work proposed is more specifically located as being from (Milepost) or (Highway Station) to (Milepost) or (Highway Station) on the side of highway.

I have read this Agreement, understand its provisions, and agree to abide by it and the utility accommodation policy of the Iowa Department of Transportation.

Applicant:

By
Name of Agent (print or type) — Agent/Owner Signature — Title

Name of Owner (print or type) — Date: Month, Day, Year

CITY ACTION:

(If proposed work is within an incorporated city, city action is required)

"The undersigned city joins in the grants embodied in the above permit executed by the Iowa Department of Transportation on condition that all of the covenants and undertakings therein running to the Iowa Department of Transportation shall inure to the benefit of the undersigned city and recommends action on said permit application as noted below by the delegated city official."

☐ Recommend Approval ☐ Do Not Recommend Approval

Signature — Title — Date

By
Type or Print Name — Authorized Official for the City of

COUNTY ACTION:

(If proposed work crosses county right of way, county action is required)

"The undersigned county joins in the grants embodied in the above permit executed by the Iowa Department of Transportation on condition that all of the covenants and undertakings therein running to the Iowa Department of Transportation shall inure to the benefit of the undersigned county and recommends action on said permit application as noted below by the delegated county official."

☐ Recommend Approval ☐ Do Not Recommend Approval

By
Signature — Title — Date

Type or Print Name — Authorized Official for the County of

Special Requirements:

In addition to the stipulations stated on Page 2 of this form the following special requirements shall apply to this permit:

FEDERAL HIGHWAY ADMINISTRATION ACTION *(When Required)*

Recommend ☐ Approval ☐ Do Not Recommend Approval

Authorized FHWA Representative — Date

DEPARTMENT OF TRANSPORTATION FINAL ACTION:

☐ Application Approved ☐ Application Denied

Authorized Highway District Representative — Date

(Type or Print)

Notice of intention to start construction or maintenance activities on the highway right of way shall be made to:

Local DOT Contact Person — Address — Telephone

APPLICANT IS RESPONSIBLE FOR FILING THIS SECTION OF APPLICATION. ASSISTANCE FROM DEPARTMENT AVAILABLE UPON REQUEST.

DEPARTMENT ACTION RESPONSIBILITIES

PLEASE CONTINUE ON PAGE 2

Figure 4: Permit Application for the Iowa DOT [15]

The permit is circulated through other departments in the agency as needed. Field investigations are performed. If there are issues in the permit that need to be discussed, these provisions are negotiated. The application is then processed, and the permit is issued. The agency then has the right to enforce the provisions of the agreement and perform a final inspection [11]. The permit process for the Texas DOT follows this approach. It is shown in a flowchart in Figure 5.

The approval notification step in the flowchart also includes supplying information of contact individuals in the DOT who must receive notice before the utility can begin work. A list of special provisions for the project is also provided [17]. According to the policy of the Iowa DOT, the DOT is required to reply to the permit application with 30 days [15]. Typically though, getting a permit from the DOT takes one to two months, depending on the importance of the work. This period could range from one day to longer than a year. If the situation is an emergency, the DOT will act as fast as possible. In general, if the work is outside of state-owned ROW, the utility doesn't need a DOT permit. Likewise, if the utility is on private property, a permit from the city might be required, but again not from the DOT [20].

As part of the permit agreement, a written document that shows a highway agency approves ROW for occupancy and that the parties agree on financing and the relocation work, the utility owner must promise to perform several tasks. The owner must provide notice when the work is completed. They must also indemnify the highway agency and follow the specifications of the agency [11].

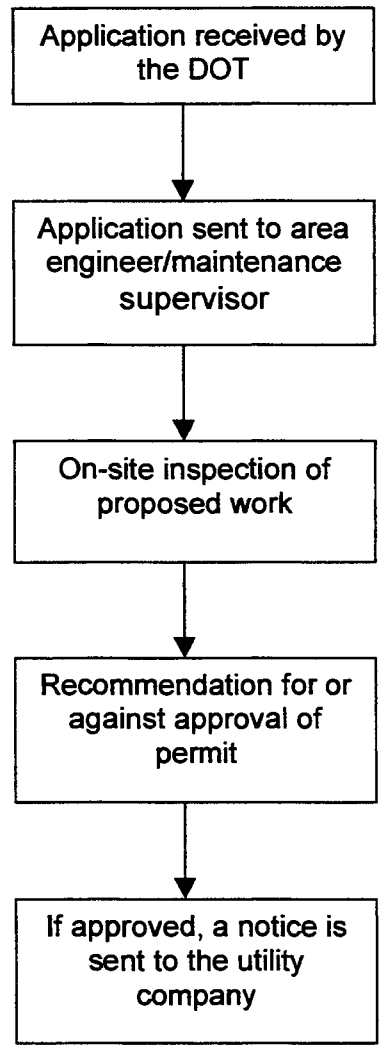


Figure 5: Utility Permit Process of Texas DOT [17]

Approval from the city is also required if the utility is within the city limits. The FHWA must also approve the work if the utility is in, on, above, or below the ROW of an interstate highway or is attached to interstate highway structures [15].

The Florida DOT has the following policy regarding utilities that are issued a permit to be on DOT ROW [6, p.7]:

> "Any utility unreasonably interfering in any way with the convenient, safe, or continuous use, or maintenance, improvement, extension, or expansion of a state road or publicly owned rail corridor shall, upon proper notice, be removed or relocated by such utility."

This type of policy is common and is a risk a utility owner accepts by placing the utility on state ROW.

Lastly, oftentimes the utility owner must provide the required drawing at the end of the project. At the completion of a road project, some state DOT's, such as Iowa and Texas, don't require the utility owner to provide as-builts.

The FHWA also has its own permit requirements. A description of the planned facilities along with the DOT's standards for the utilities should be supplied. The FHWA will also require drawings showing where the existing or proposed utility is located in relation to the existing or planned highway and ROW lines [11].

An item that may make utility coordination difficult is when utilities have been relocated. For the I-235 project, utilities were relocated in the years 2000 and 2001 in preparation for the later years of the project. The problem is these relocations have not been inputted into a CADD file or inserted into the design plans. As a result, when contractors start a project, they don't have much information, if any, on the relocated utilities.

Even though the relocated utilities weren't added to a CADD system, the relocation or new utility construction was recorded elsewhere. The Iowa DOT has a database with a summary of the utility permits. The original procedure to access this

information is that the DOT had to search through the database summary to find permits for the desired highway. Doing a search for the desired highway would produce ID numbers for relocated or new utilities in that area. These ID numbers were the permit numbering system. The original hardcopy permits are physically filed according to this system.

The permits in the system do not contain information on the elevation of the utility. This also poses difficulty for future location. Not knowing the elevation can cause extra work in the future. To acquire the elevation after a utility is in the ground, the area must be potholed. As mentioned in a previous section, potholing is a process of carefully digging a hole in the ground until the utility is found. Another more expensive way of finding the depth of a utility is using SUE.

For a temporary fix until the locations of the relocated or new utilities are inputted into a CADD file, a possible solution was to place the information on a scroll, an enlarged version of the design plans.

The information on the scroll could contain the location based on station and also distance to a landmark. This visual on the scroll could then be used as an aid for contractors during preconstruction meetings. It would help contractors to actually see where the utilities were moved. The scrolls would also mark utilities that have been abandoned. By law, once a utility line is abandoned, the utility company in Iowa is not required to remove it [15].

Having a visual of abandoned utilities would be beneficial for it is unnerving for a contractor while excavating to unearth a gas line and not know whether the line

is active. With viewing the scrolls during preconstruction meetings, the contractor would already know that there was an abandoned gas line in the area.

In this project, relocated or new utilities will continue to be a problem. However, a possible way of maintaining utility status and updating locations on the scrolls is a way that the contractor would have access to this information at the I-235 main office. Placing the information on the scrolls would be more time efficient than the other option. To locate the information before, the utility engineer had to travel to another office, find the ID number, and then search the files for the physical copy of the permit.

A recommendation for this project would be to input utility relocations, new utilities or abandonments into a CADD file as part of the permit process. If it was included in the process, it might be inputted soon enough to be included in the design plans. Especially in the situation of the I-235 project, where work is being performed up and down the interstate corridor, an accurate and updated record should be kept. With the number of utilities in the project area, it is virtually impossible for an individual to know the situation and location of each utility.

There is one problem with the idea of using the permits to record new utility locations. Utilities are oftentimes not placed in the field as they are shown on the permit. There are many things that could occur in the field that would lead a contractor to change the planned placement, such as a boulder obscuring a boring.

This issue also brings up a problem with as-builts. As-builts also don't accurately represent what was actually built. One utility company in Des Moines purposefully creates inaccurate as-builts so that the DOT or contractors do not rely

too heavily on them. They would rather contractors know of the utility being in the area and then rely more on the approximate locations given by a utility locating service, such as the one that one-call helps to provide.

The Texas DOT has also had difficulty maintaining all the information involved in the permitting process, such as location and type of work. This can then result in going over budget or legal liabilities arising during construction and maintenance projects.

Some of the problems were due to transportation agencies and utility not using the same terms, symbols, and classification systems. If both groups do so, it would aid in managing utility data. Researchers Quiroga, Ellis, and Shin [17] developed a database model for the Texas DOT that would incorporate utility data and highway data. The model included an Internet data collection system that would collect information from utility companies and allow the DOT to track the data at the same time. This would then provide a way for the DOT to be alerted of utility companies that might be affected by work proposed in the permit.

3.2.7 Letting

The question of when relocations of utilities have to be completed with respect to the letting date depends on various factors. The utility must be cleared before setting the project's letting, according to an Iowa DOT utility engineer. This means that if a utility is on public property, the utility must be notified of the conflict. The conflicts are determined primarily by the DOT because the projects are on DOT ROW, but utility companies do aid in supplying information [20].

According to the policy, cost of relocation of a utility in ROW as a result of highway construction is that of the utility company [15]. If the utility is moved and the plans change forcing the utility to be moved once again, the DOT pays for this only if the original relocation was completed by the letting date [20].

The utility should be cleared before the letting date of a project. This is the ideal situation though. At the latest, unless part of the construction itself, the utility work should be out of the way of the contractor for the project. As the Iowa DOT policy states, the utility should be cleared "whenever possible, in advance of the highway work" [15, p. 14]. Once again, this doesn't always occur. Therefore, the owner may put in a "Cooperation with Utilities" clause which is basically a no-damage-for-delay clause that puts the contractor on notice that there may be further action to be taken by utilities and that the contractor needs to do his/her own investigation of the site.

Even though it is the right of the DOT to establish relocation deadlines, the deadlines should be reasonable. As a report by the Highway Research Board states that "regardless of whether the state or utility is ultimately responsible for the cost of the relocation, the responsibility for seeing that the move is made rests with the state" [18, p.5].

3.3 TYPES OF UTILITIES

3.3.1 Previous Utility Relocation Studies

Research was performed for the Florida DOT by the University of Florida. It was determined that on average, water relocation projects were allocated 34 days.

Telephone projects were given 204 days. Electric durations ranged from 90 to 183 days, depending on the utility company. These durations though are not actual onsite construction durations. Rather, the scheduled relocations were about three times the onsite durations. Figure 6 shows a summary of schedule time requested by various utility companies compared to their actual time on a site. The difference between the durations is to account for issues such as the following [6]:

- Weather delays
- Labor shortages
- Equipment availability
- Contractor's work schedule
- Problems with design
- Time needed to receive permits
- Preliminary activities such as engineering

Conservative relocation schedule times were a reflection of actual work times plus a contingency for unexpected occurrences and preparatory work.

The research team that worked on "Development of a Utility Production Rate Scheduling Reference for FDOT Construction Projects" concluded that the relocation schedules were an accurate estimate of utility relocation durations.

As a representative from an electric company responded to the researchers' survey, additional time should be included besides actual construction time for utility relocations. The total project time should include time for support activities as well

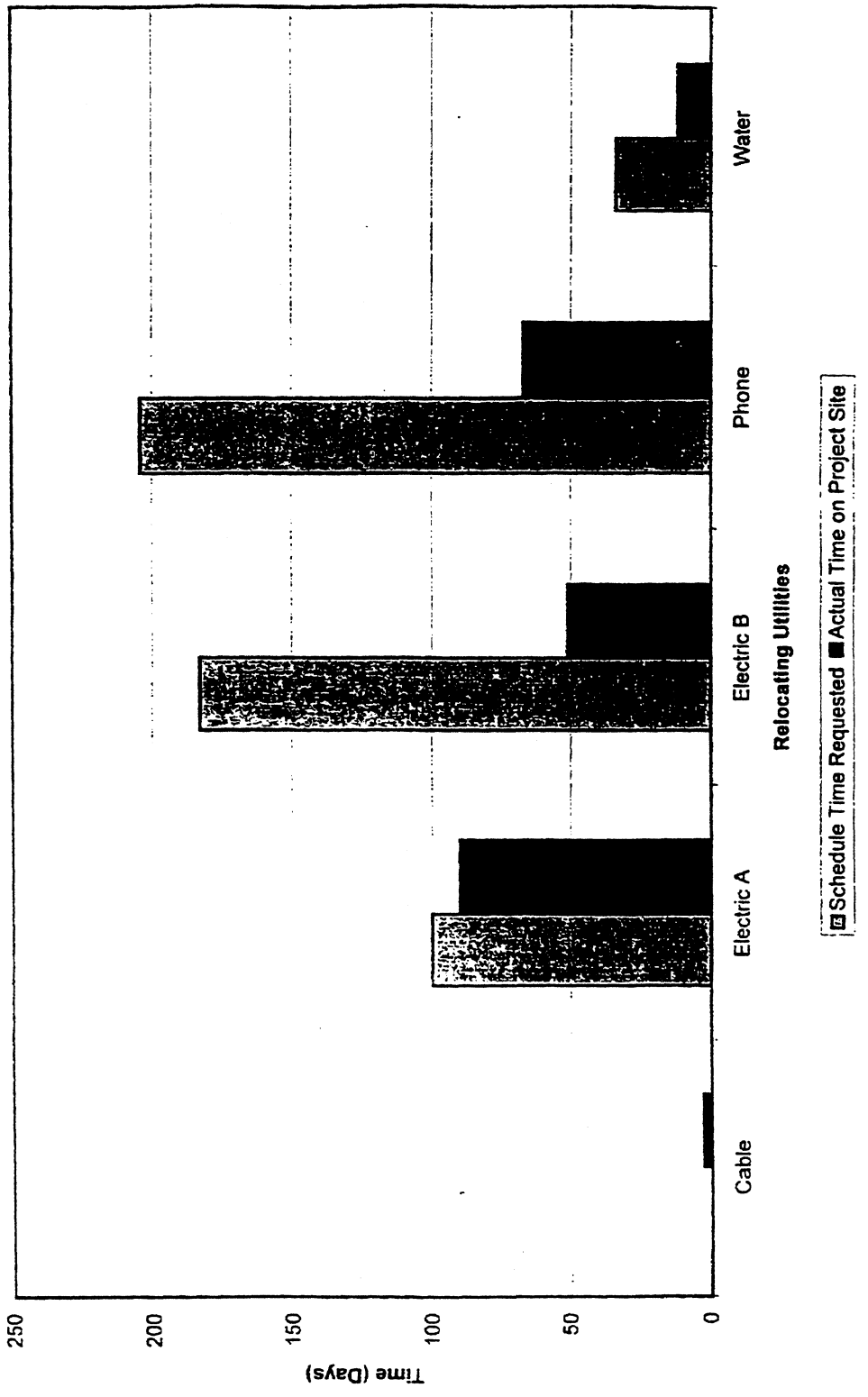


Figure 6: Utility Relocation Durations: Scheduled Time and Actual Time [6]

as time for external forces. Support activities would include design, permitting, material procurement, scheduling, and surveying. External forces would include weather, labor availability, ROW acquisition, and attachments of cable and telephone on electric poles [6].

3.3.2 General Timelines for Various Utilities

In the following sections, the various types of utilities will be discussed. This will involve detailing characteristics and typical total project durations in Iowa for the types of utility projects.

The Iowa DOT uses a general timeline of two years for utility work: one year for items such as ROW, hiring a consultant, and construction and then a one year period of float [20]. This one year of float though oftentimes ends up being used because of various delays due to office to office communication, shortages in staff, and relocations not being viewed as a priority by utility companies.

3.3.3 Sanitary and Storm Sewers

Sanitary and storm sewers tend to be the most difficult utility to work with. Not only do they have to account for issues of gravity flow, they also have a limited number of options for relocation. If consultants are brought onto a project, the three to four month consultation process should be accounted for in the schedule. Other issues considered are depth of placement, the buying of ROW, staging, and the letting process [20].

Length of schedule and cost of sewer work are a function of the depth of the facility [6]. Overall though, sewer projects normally take two years to complete from conception to the final days of construction [20].

3.3.4 Telephone

Next in line with respect to the complexity is the relocation of telephone facilities. Relocation of telephone utilities might involve splicing, which is a time consuming process due to the preparatory work involved. According to an Iowa DOT utility engineer, there are not a lot of contractors available in the Des Moines area to perform this kind of work. Telephone work does not require a letting, because the utility owner handles the bidding process if there is a bidding process. Telephone projects could be performed quickly, but the cost to the utility owner would be relatively high.

If telephone work is not planned in advance, the possibility for the work to be accelerated increases so that the area of the project can be clear for construction.

If this is a service line project, such as lines in a development, the work would be performed in a six month period by the company's own crew. If the utility is on a set of poles with another utility, another three to six months should be added to the six month to a year typical period for preplanning and relocation. Overall, this process should be allotted two years [20].

3.3.5 Water

Third with respect to difficulty is water work. This type of work involves issues of depth and size of main. The size of main determines whether or not it will require

a contractor or if the work might be performed in house by the water company. In general, a 16" or larger main will require a contractor to perform the work. Water main projects are occasionally tied to a grade and pave or bridge projects. In this case, the water main projects wouldn't need a separate contract. If the project goes through the bidding process, the six to eight weeks should be figured into the duration of these projects. Usually though, the water main planning and relocation process will typically be allotted 18 months [20].

3.3.6 Electric and Gas

Of the various utilities discussed so far, the least difficult to relocate are electric and gas distribution lines. Both types have a vast network of lines. The ability to re-route lines and the already present network provides flexibility. Relocation projects may take six months to a year depending on ROW issues, with the work typically performed by the utility's own crews.

Also for electric work, there are little scheduling differences between underground and above groundwork.

While distribution line are relatively uncomplicated, electric and gas transmission lines tend to be more difficult than distribution lines [20]. As the electric company representative who participated in the study, "Development of a Utility Production Rate Scheduling Reference for FDOT Construction Projects," stressed that electric distribution and transmission be treated differently. Transmission should be allocated more time overall because the design, permit, material procurement, and actual relocation time will take longer [6]. ROW options also are limited for

transmission projects due to the size of the area needed for towers and equipment. Such projects are also hazardous and difficult to take out of service as transmission lines can only be disconnected at slow times. Peak times for Des Moines are typically from early May to October. Transmission line relocations, which do not occur as often as electric distribution line work, should typically be given two years from conception to construction completion [20].

3.3.7 Other Utilities

Petroleum pipeline projects would take the same period as gas transmission, which is typically two years.

Cable TV companies often follow the power company if it is an aerial cable. These would then take about the same length as gas or electric distribution, and thus cable should be allotted six to twelve months [20].

3.3.8 Summary

Table 1 shows a summary of durations that are typically allotted for utilities by the Iowa DOT.

Table 1: Summary of Utility Durations Used By the Iowa DOT

Type of Utility	Typical Total Duration
Sanitary and Storm Sewer	2 years
Telephone	Service lines: 6-18 months Typical: 2 years
Water	18 months
Electric and Gas Distribution	6 months - 1 year
Electric and Gas Transmission	2 years
Cable	6 months - 1 year
Petroleum	2 years

3.4 STAGES OF INCORPORATING UTILITIES INTO THE SCHEDULE

3.4.1 Summary of Processes

There are several different processes of incorporating utilizes into the schedule. The process depends on which stage one is in or how detailed is the schedule. The three processes that will be discussed in the following sections are the initial stage, updating and detailed schedules.

3.4.2 Initial Process

Figure 7 shows the initial stage. The first step in this process was collecting information from the DOT utility engineer or the utility companies as to the location of the utilities. This information was inserted into the schedule as utility tasks. Figure 8 shows the schedule with utility tasks. The tasks were grouped according to utility company (such as Des Moines Water Works (DMWW), Mid American Gas (Mid Am Gas), Mid American Electric Distribution (Mid Am Elec Dist), and Mid American Electric Transmission (Mid Am Elec Trans)). The utility tasks might include more than one conflict for the location. For example, the task for Des Moines Water Works might include a main that has to be abandoned and a crossing that needs to be relocated.

Scheduling utility conflicts might also mean calculating durations of the construction itself. Default durations are used in the schedule when design plans are not supplied. The default duration contains several time elements, such as ROW, design, letting and construction. The duration bars indicate on the schedule whether utility work should be in the process. This means that if the line that marks the present time is over the bar that represents the duration of a utility, the utility office at the DOT should have that specific utility on the radar screen. The default durations might seem excessive, but they can be explained by the steps of relocating a utility. The communication back and forth between the utility company, the DOT, possibly the city and the FHWA along with the planning and other preparatory work takes time.

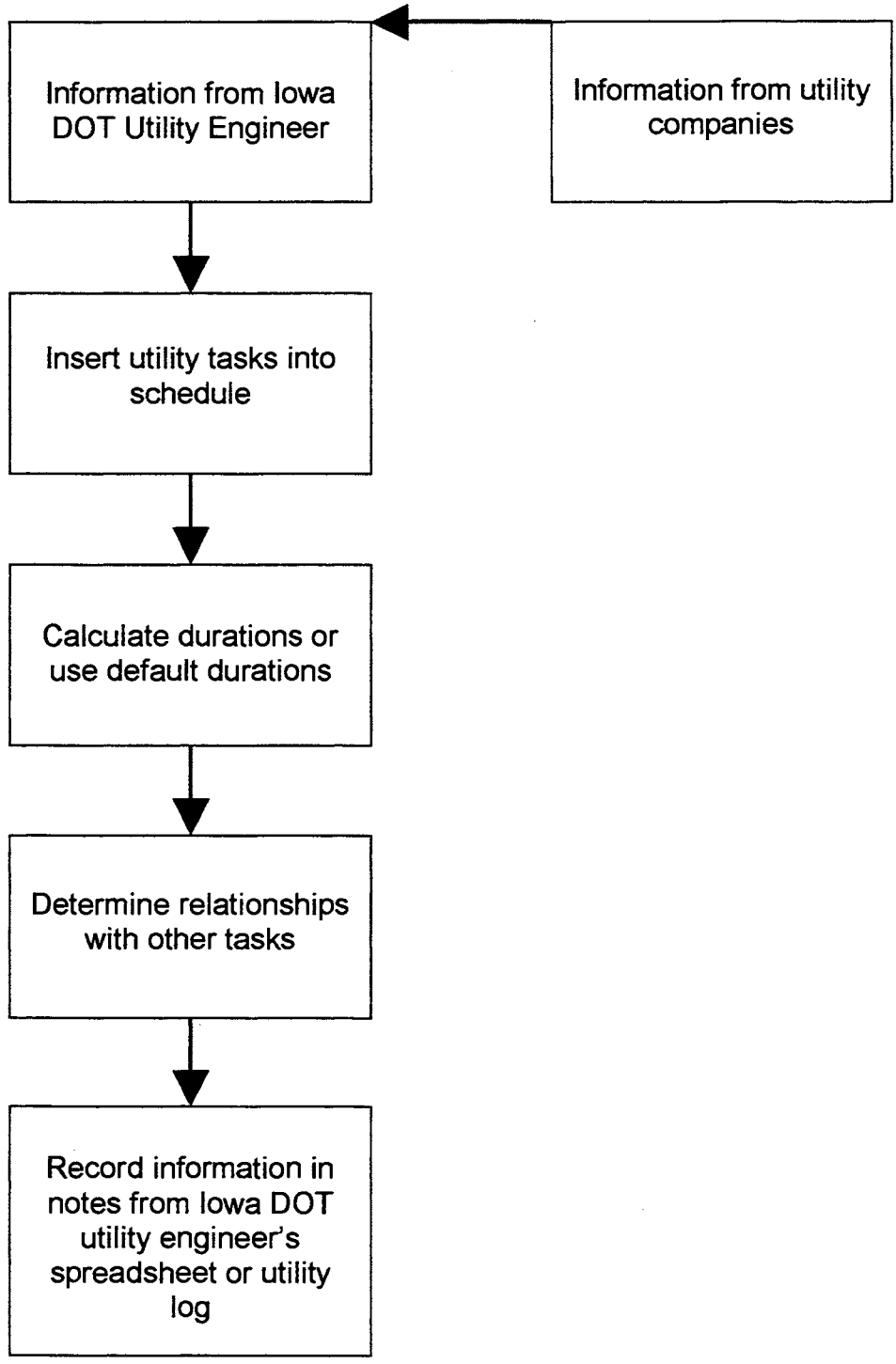


Figure 7: Initial Stage for Incorporating Utilities into Schedule

	Task Name	Duration	Letting Date	Start	Finish
1	**I-235**	**1763 days**	**NA**	**Fri 2/11/00**	**Fri 11/10/06**
2	**Section 1-3**	**1511 days**	**NA**	**Wed 12/27/00**	**Mon 10/9/06**
3	Bridge Fence - 50th	40 days	NA	Mon 6/3/02	Fri 7/26/02
4	42nd St. Bridge (PPCB) Repl'mt., Approaches	65 days	Tue 1/15/02	Thu 3/21/02	Sun 7/14/02
5	Bridge Fence - 42nd	5 days	Tue 3/26/02	Mon 7/15/02	Fri 7/19/02
6	42nd St. Utilities - Cleared	0 days	NA	Tue 1/1/02	Tue 1/1/02
7	**35th St. (PPCB)**	307 days	**NA**	**Fri 3/14/03**	**Fri 5/14/04**
8	Noise Wall (35th to W of 28th, S. side)	87 days	Tue 1/14/03	Fri 3/14/03	Mon 7/14/03
9	35th St. in WDsM, Interchange work	102 days	Tue 1/14/03	Tue 7/15/03	Fri 5/14/04
10	35th St. Bridge Repl'mt	50 days	Tue 1/14/03	Thu 3/20/03	Thu 6/19/03
11	Bridge Fence	5 days	Tue 1/14/03	Fri 6/20/03	Thu 6/26/03
12	35th St. Culvert Extension	60 days	Tue 1/14/03	Thu 3/20/03	Wed 7/9/03
13	**35th Noise Wall Utilities**	**480 days**	**NA**	**Wed 12/27/00**	**Tue 10/29/02**
14	W DsM S S (Default Dur.)	480 days	NA	Wed 12/27/00	Tue 10/29/02
15	Amoco Pipeline (Default Dur.)	360 days	NA	Wed 6/13/01	Tue 10/29/02
16	**35th Interchange Utilities**	**480 days**	**NA**	**Wed 3/14/01**	**Tue 1/14/03**
17	Mid Am Elec Dist (Default Dur.)	240 days	NA	Wed 2/13/02	Tue 1/14/03
18	Qwest (Default Dur.)	480 days	NA	Wed 3/14/01	Tue 1/14/03
19	AT&T	480 days	NA	Wed 3/14/01	Tue 1/14/03
20	WDsM Water (Default Dur.)	480 days	NA	Wed 3/14/01	Tue 1/14/03

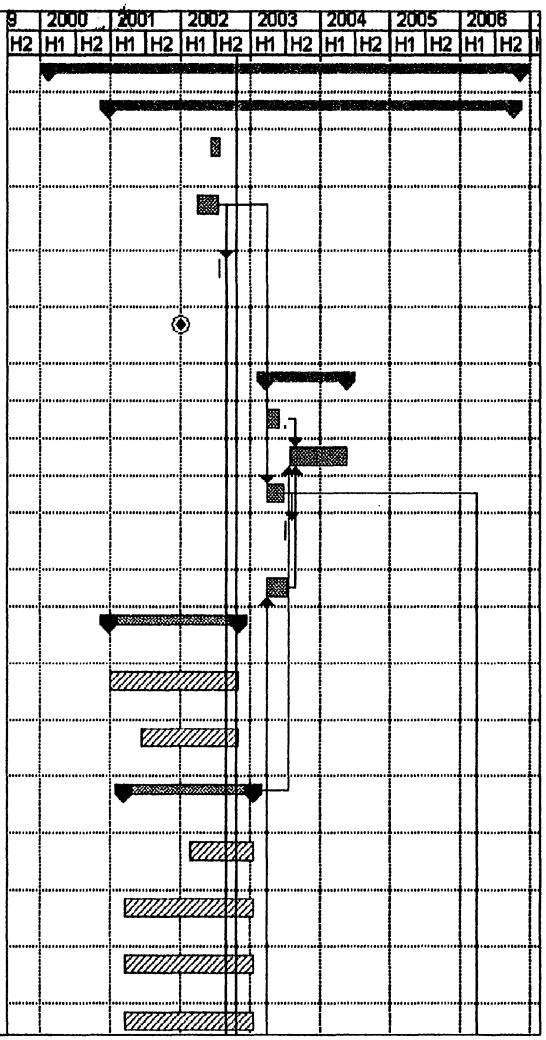


Figure 8: Schedule Showing Utilities as Tasks

Different default durations that were shown in Table 1 were put into the Iowa State University team's schedule after an interview with the original utility engineer from the Iowa DOT. These were more accurate than using a schedule template that uses the same duration for all utilities. The template created by Tee [23] that was previously used to determine durations for Iowa State University's project schedule is shown in Figure 9.

The utility work template that was previously used had the following items:

- Pre-agreement and notification
- Utility agreement
- Utility design
- ROW
- Permit
- Utility relocation
- Plan turn in date for DOT letting
- DOT letting

The above items combined to form a total duration of 890 calendar days. The template was also created with information from a DOT engineer. There are some differences in the template compared to what is currently being used by the scheduling team. The template shows the successor of the utility construction as the plan-turn in date for DOT lettings. Currently, the Iowa State University scheduling team has designated for the utilities to be completed by the letting date, which is twelve weeks after the plan turn in date. DOT policy actually states that the utility must be out of the way of construction, although utility companies seem to be

	Task Name	Duration (Calendar Days)	Successors
1	⊟ **Utility**	**890 days**	
2	Pre-agreement / notificatio	0 days	3,9SS-730 days
3	Agreement	180 days	4SS+90 days
4	Design	180 days	5SS+135 days
5	ROW	365 days	6FF
6	Permit	30 days	7
7	Construction	120 days	8
8	Plan Turn-in day for DOT Letting	0 days	9FS+12 wks
9	DOT Letting	0 days	

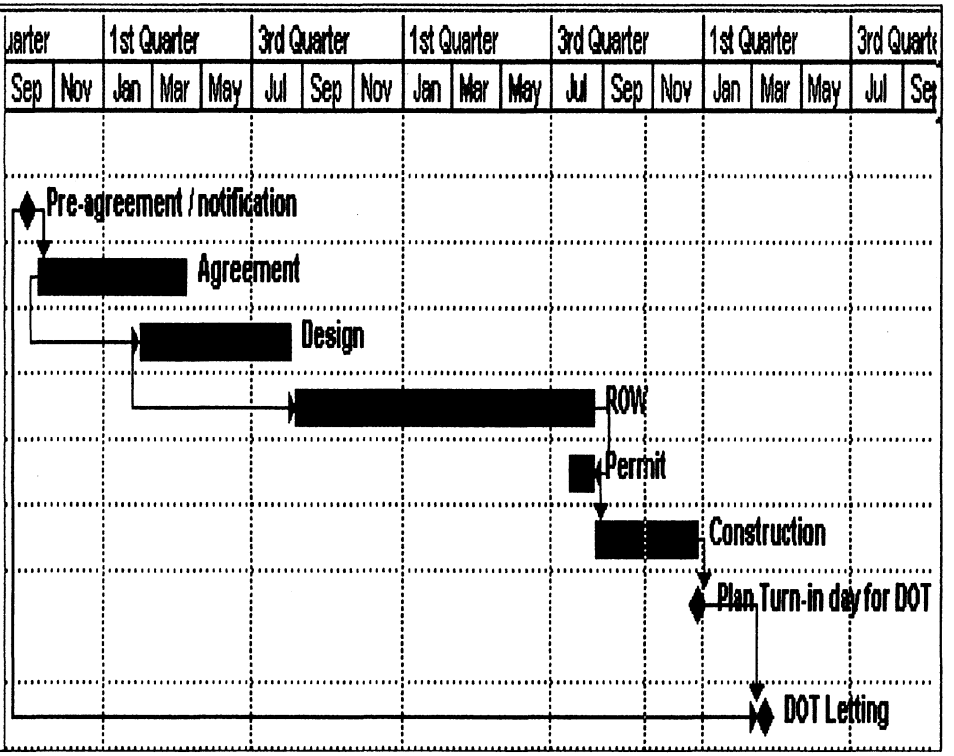


Figure 9: Utility Template [23]

more interested in the actual start date of construction. This date though is difficult to predict precisely. Contractors cannot start a project until the contract is signed. They may start work the moment this is done or may wait days or weeks. Therefore, being conservative, the date utilities were set to be clear was the letting date.

The other guidelines Tee used in the template are [23]:

- Pre-agreement and notification occurs two years before the DOT letting
- Half of the time agreement occurs before utility design
- ROW acquisition begins 4 ½ months after utility design starts
- ROW includes notification, review design, and setting ROW lines
- Utility relocation construction requires four months
- Plan turn in date occurs twelve weeks before a letting date.

Although using the new default durations is a better fit than using the duration from the template, they still aren't as accurate as they should be and further research could be done in this area.

In the current schedule, the relationships between the utility and the various projects were determined. This means that if utility needs to be cleared before a bridge project and a grade and pave project, the relationships will both be inserted into the schedule. The last steps for the initial process will be inserting the information obtained from the DOT utility engineer, utility companies, or any other source into the notes section of the schedule. The notes section will then act as a document archive containing notes on location, planned design or construction, or

any other information related to the utility available at the time. Figure 10 shows the notes archive.

Most of the data that was used by Iowa State University to incorporate utilities into the main I-235 project schedule was supplied by the Iowa DOT utility engineer for the project. The information from the engineer was supplied to Iowa State University in two types, in a spreadsheet and in a Microsoft Word document.

The sample of spreadsheet form is shown in Table 2. The column headers show the project. Both the letting and the project description are shown when available. The utility companies or entities are assigned rows. In the corresponding cells, if there are utilities and possible work in the area or if there are utilities but not work or if the area is clear, it is noted. For example for the West Des Moines 35th Street interchange (430), there were utilities issues. One issue was for a telephone company. The situation in this area is summarized in the corresponding cell for the telephone company, US West, and the 35th St. interchange project. The cell states the following:

> "6 tile duct and 12 plastic ducts (18,300 [pairs] + 3 [fiber optic] Cables). Vault S of I-235 in the right where new EB on-ramp will be located. Therefore, this MH MUST relocated. MH on North side, probably ok for fill retaining wall. Remaining conduit in 35th St is probably ok since grade is not changing very much. Copper cables going to businesses on North will need to be abandoned. This will be messy!!!"

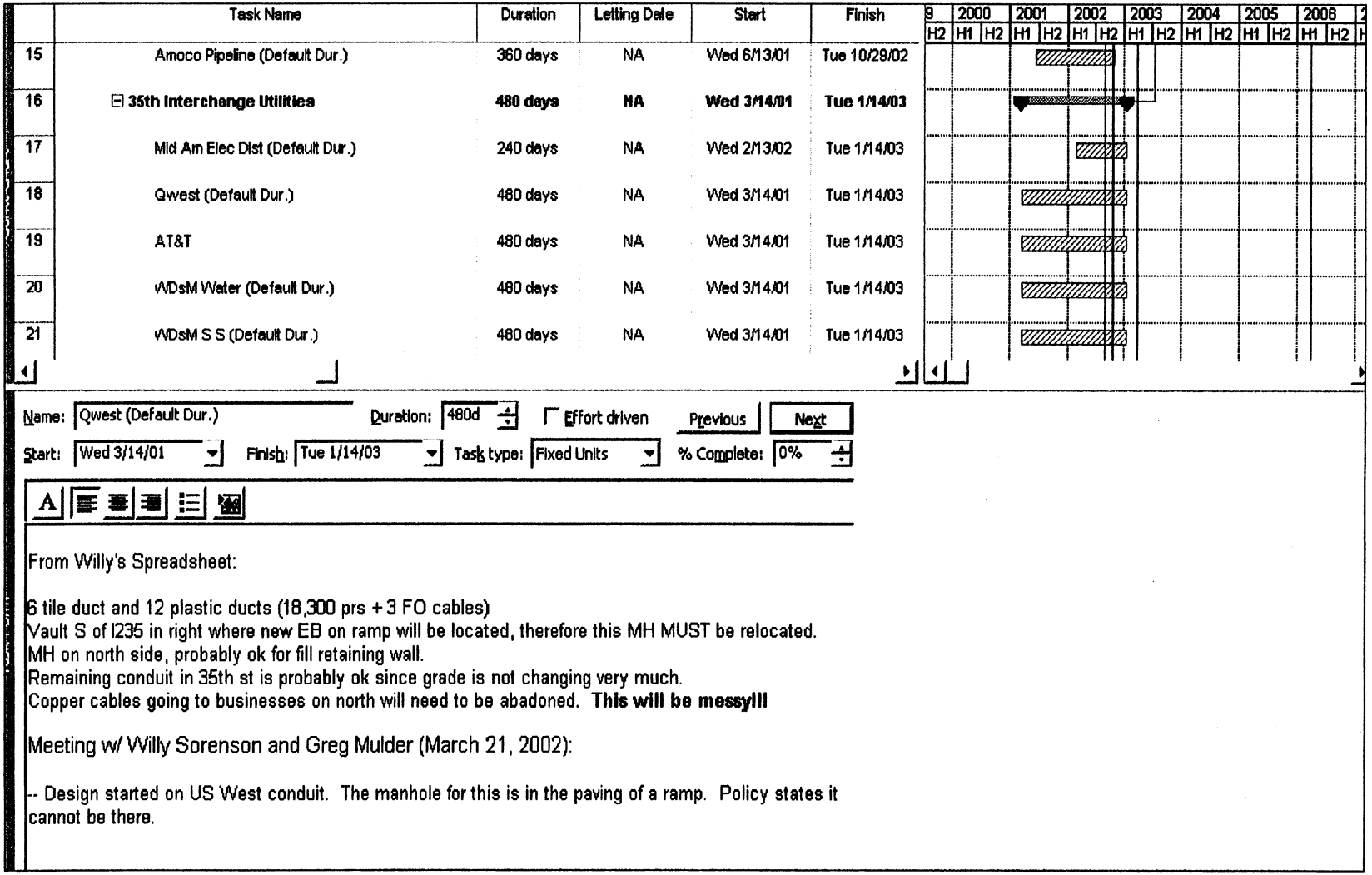


Figure 10: Schedule Showing Example of Archived Notes

Table 2: Sample of Utility Spreadsheet

Utility Companies On the Project **Updated July 10, 2001** **Jim's excel sheet** **Received Plans??** **Updated??** **Section**	January 14, 2003 Letting **Grading at 35th St in WDM** **(430)** **Yes**
Mid American Electric Distribution	Poles and crossing have a very good chance of having to be relocated. Is it attached to bridge? N. end, above ground transformer probably in the way **This area is definitely not clear!!!! Need a very close look**
Qwest	6 tile duct and 12 plastic ducts **(18,300prs+3 FO Cables)** Vault S of I-235 in right where new EB on ramp will be **located, therefore this MH MUST be relocated.** MH on North side, probably ok for fill retaining wall Remaining conduit in 35th St is probably ok since grade is not changing very much Copper cables going to businesses on North will need to be abandoned **This will be messy!!!!!!**
McLeod USA	Cable along Westtown Pk way, but I don't think we go that far north, If not – Clear, Conflict #4
West DM Water	8" w/ casing on east side DMWW will check on depths from Westtown to North of Woodland. If they are deep and outside culvert ext, could be OK.
West DM Sanitary Sewer	**Sewer line MUST be Relocated at new WB off Ramp, around building.** **Sewer line MUST be Relocated at new EB on** Ramp, probably on excess ROW 12" crossing @ sta 430, should be evaluated for lining or encasement. DOT put the line in originally

This type of document displays information in a summarized fashion. It is a relatively simple way to look up the status of a project. It allows one to see what conflicts might be in the area quickly. In some of the cells, a utility conflict is referred to by a number. Table 3 shows a section of the spreadsheet that contains an example of this.

In the cell for the Martin Luther King interchange project (305) and the city of Des Moines Sanitary Sewer, several locations are mentioned by number. This number refers to a specific utility conflict that is detailed in the Microsoft Word document. For this utility, the Word document that describes sanitary sewers is used as a reference. The corresponding statement for sanitary sewer conflict number 39 is the following:

> 39) South side @ School St. and MLK. Existing sanitary in **School St. which will become a Ramp Correct??????????.** Need to know what homes are being removed along School St. Currently hooked into DOT Storm at School and NB MLK. Need to look at if ramps should be treated same as ML like this area. V+K should look into this. This section of sewer is in existing city right of way and in the area of a future ramp. The IDOT policy says that the utilities have to relocate at the utility's expense. This sewer currently is tied to an I-235 storm sewer and needs to be rerouted along the south edge of future I-235 ROW to the sanitary sewer at 16th Street and School Street as discussed in item 37 and 38. There may be intakes on this line that should be redirected to storm sewer as a part of the I-235 construction.
> This is a **MUST DO**, if all the homes are purchased by the DOT from I-235 down to Cottage Grove and between MLK and 19th, this problem goes away because the line will not have any flow from it. We should assume this will happen, but will not know for sure until the public meeting in on Jun 27, 2000. I have received an interdepartmental memo that states we will be purchasing these homes/business.
> $120,000 Conflict / abandonment will occur in 2002
>
> Dave's cost was to go from 18th to MLK. The part from 19th to MLK goes away is we purchase all the homes in the middle.

The Iowa DOT utility engineer periodically updated the information. In some of the Word documents, dates are shown according to when that information was added to the document.

Table 3: Sample of Utility Spreadsheet Showing Conflict Numbers

Companies On the Project	Letting Updated 7/10/01 **MLK Interchange** **Cottage Grove, MKL, Ramps and retaining walls** **IM-235-2(305)7—13-77** **MLK down to Center St**
Mid American Electric Distribution (Updated 5/30/01)	**8 minor relocations** **Many many abandonments**
Mid American Gas Dist. and Trans. (Updated 4/11/01)	Lots of possible storm sewer conflicts ramps cuts See Sheet 28 and 29 for areas Abandonment will be solution in many cases however not all, some new connections will have to be run from remaining areas
Qwest (updated 5/25/01)	**MAJOR WORK TO BE DONE, everything near here** Duct x-ing west of Cottage Grove **MUST BE RELOCATED** Duct x-ing west of 19th St **MUST BE RELOCATED** SAC Station @ 1045 21st St **MUST BE RELOCATED** Must look closely along Cottage Grove EVERYTHING AROUND this Interchange Must be Looked at, but currently, Qwest's plans are too vague and the DOT plans do not show everything.
Des Moines Water Works (updated 7/10/01)	Areas w/ in Const Zone #60-81, 84, 87 and 88,89 **MAJOR WORK TO BE DONE** **Day St Relocation: 78, 79, 80, 81, 82, 83, 84** **Cottage Grove x-ing: #66, stage 3 need done in Stg 3** **School St relocation: 88,89** **24th and School: #60 small relocation for sanitary** **Abandon: 61,70,77** **Checking on 62, 63, 64, 65, 71, 72,74** **Fire Hyrdant Relocate: 67** **Day and 22nd ST: #68 small relocation** **Olive St Connection: #69 small relocation (tap into 20")** **UAC:73, 85, 86(for now),87,** **Leyner/Center Connector: #75, 76 (DM crews, sm relocation)**
AT+T Cable (TCI) McLeod USA	There are things to do, but all minor or wreck out Conflict #7, really depends on M/A crossing and sanitary sewer work and relocated Day St wk, **Second Pole on North side MUST BE MOVED** M/A is not on this pole, only McLeod, Qwest, and AT+T
City of Des Moines Sanitary Sewer	Locations 35, 36, 39, 40, 41, 42, 43, 44, 45, 46,47, 48 V+K Doing design work for these

There are several differences between the Word document and the spreadsheet. The document goes into more detail that the spreadsheet. It also shows the progression of events or change in information related to that area's utilities. The two files compliment each other. The spreadsheet is a quick and easy reference, whereas the Word document explains the situation more. The Word document is sorted by location, usually from west to east.

There are several disadvantages to this system of record keeping. First, the spreadsheet is difficult to maintain. When Iowa State University received a copy of the file, there seemed to be no obvious order. The columns were roughly organized by fiscal year. Then within the fiscal years, the projects were sorted by location. As the letting dates changed though, it became very time consuming to make the changes and then to reorganize the spreadsheet to reflect the changes.

A problem with the combination of the files is that not all items mentioned in the spreadsheet are referred to in the Word document. Another problem is exactly the opposite—not all items in the Word documents were referred to in the spreadsheet.

The idea of what the two documents can do is very important and must not be overlooked because of their disadvantages. The idea of two documents, one as a summary and the other as a detailed reference, has a lot of merit.

Changes should be made in the organization of the spreadsheet. Just as in the Microsoft Project schedule, one should be able to search by project number or letting date. The spreadsheet could also be initially set up by location because Microsoft Excel could also sort by project number or letting date cells without

difficulty whereas sorting by location wouldn't be as simple. To ensure the usefulness of the Word documents, each item should be mentioned in the spreadsheet, if not, there is a possibility the utility might be forgotten in the pages and pages of text.

The Word document could also be an archive of emails, faxes, phone meetings that pertained to that specific utility. Rather than try to find the original document, the notes or correspondence would all be in one place. This would be very beneficial in the case of an employee leaving a position, as was the case several times for the I-235 project.

3.4.2 Update Process

The second process is the update process. Figure 11 shows the steps in this stage. As the project progressed and work began, additional information regarding utilities in the schedule was obtained. The information came from such sources as the DOT utility engineer, meetings, site visits, or design plans.

Changes are made in the schedule based upon these updates. The changes are in the form of relationship effects, archiving information, and date changes. Once again, the effects on the relationships are analyzed. The information might give details on the location of the utility and therefore which project it could delay. The update is recorded into the notes section. The notes will be arranged from most recent to the oldest information, when possible as shown in Figure 12. The source is referenced with the date and who supplied the information. That way one can tell which information is the most up to date. This also allows, if there are any questions

related to the accuracy or if more details are needed, for the source to then be contacted.

Date changes are recorded in the update process. This could mean several things. For example, the utility could be cleared from the area and would be noted as completed. Another possibility is that the project letting was moved to a later date. Therefore, the utility wouldn't have to be cleared until that date. The finish date of the utility would then be moved.

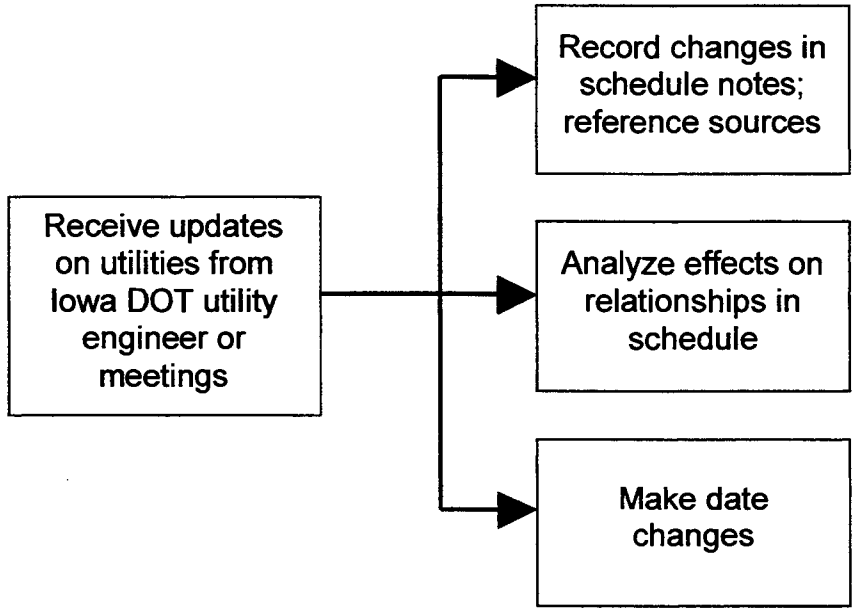


Figure 11: Updating Stage

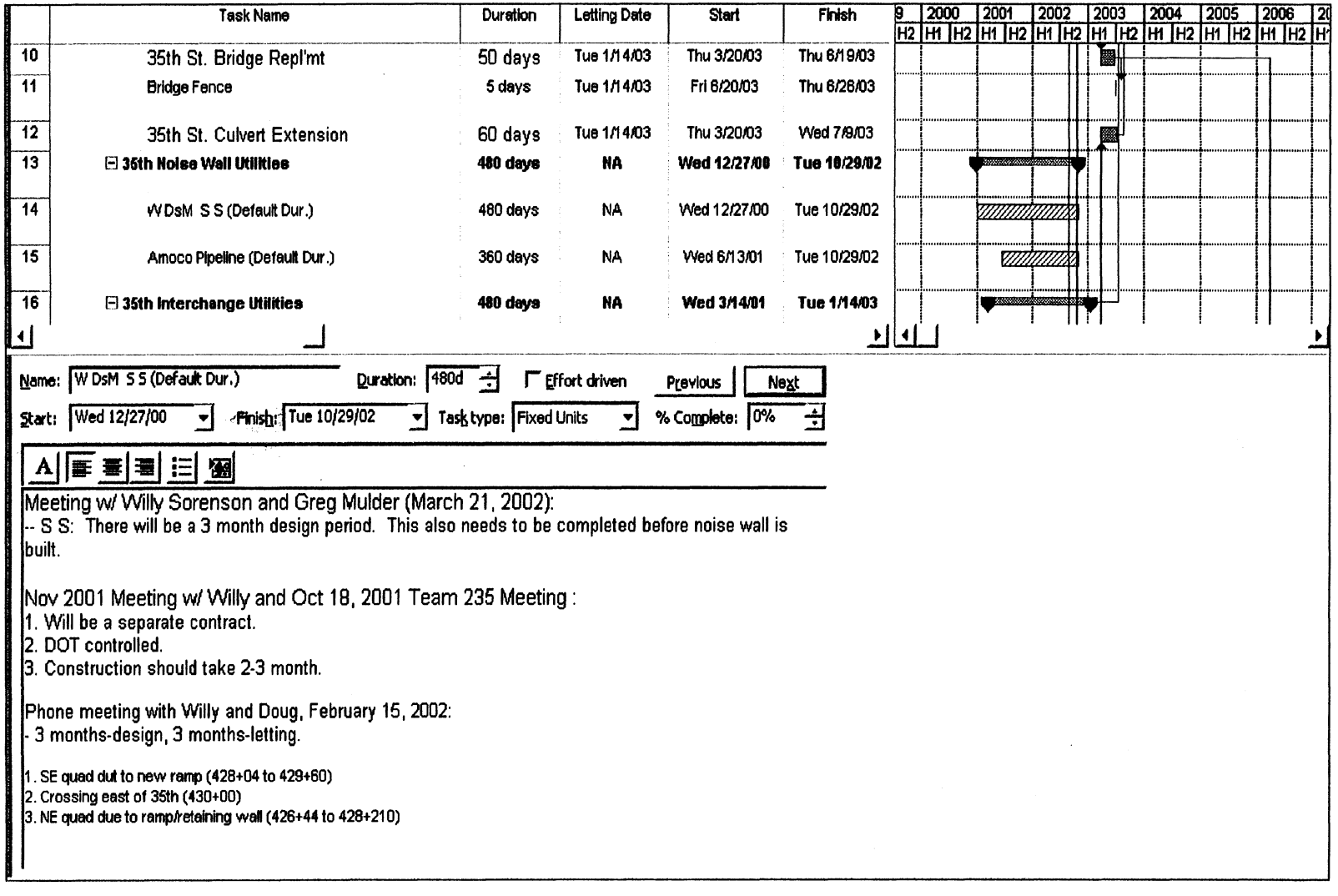


Figure 12: Schedule Showing an Example of the Notes Archive

3.4.4 Detailed Schedule Process

The final process that will be discussed in this thesis involves incorporating utilities into a detailed schedule. This process is for when utilities are part of a specific project. A good example of this is the detailed schedule for the University Avenue area grading project (340) (this is the parenthesis number that the Iowa DOT uses to refer to a project). This project was let April 20, 2002. Also tied to this project were three bridges, soil nail walls, MSE walls, and several other work items. The three utilities that were looked at in detail were storm sewers, sanitary sewers, and a water main.

The process one performs when creating a detailed schedule involves the following components:

- Identify tasks and segment work
- Determine logic
- Perform quantity take-off
- Determine durations
- Input into the schedule

Figure 13 shows the steps in a flowchart.

The first step in the detailed schedule was identifying the tasks and segmenting the work depending on the location and the amount of work. The tasks for the University Avenue project are listed under the column marked "Task name" in Figure 14. The tasks were broken down or grouped together according to how one might plan the construction staging.

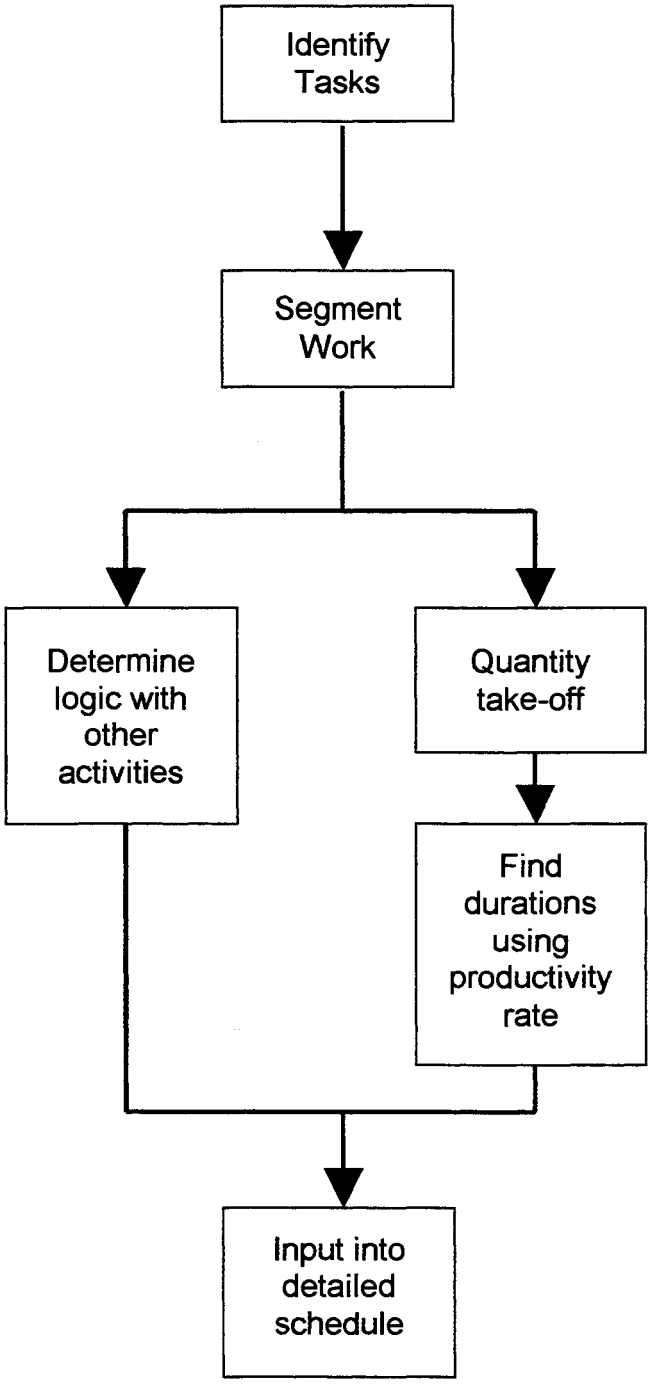


Figure 13: Detailed Schedule Flowchart

	Task Name	Duration	Predecessors	Successors
1	Clear and Grubbing	10 days		
2	Pavement Removal	7 days		35,41,48
3	(472) Sanitary Sewer and water main at E21st St. and Easton Blvd (U.11 U.12)	12 days		4,5
4	Restore E21st St	8 days	3	
5	Abandon Sanitary Sewer at E21st St and Easton Blvd	10 days	3	19,21,22
6	(458) Maple St. St/S S	30 days		7,9
7	Soil Nail #5622 at Maple St. upper N. side (V.22)	26 days	6	8SS,11SS+5 days,13SS+5
8	Soil Nail #5620 at Maple St. lower N. side (V.21 Z.01 - 14)	42 days	7SS	11SS+5 days,13SS+5
9	Soil Nail #5632 at Lyon St. upper S. side (V.24)	27 days	6	10SS,13SS+5 days
10	Soil Nail #5630 at Lyon St. lower S. side (V.23 Z.15 - 26)	27 days	9SS	13SS+5 days
11	Grading 33188+65 to 33169+20 (beginning of proj. to MSE Wall #5801 on Ramp A)	1 day	8SS+5 days,7SS+5 days	
12	MSE Wall #5801 at Ramp A (V.10 V.11)	19 days		13SS
13	Grading from 33169+20 to 33172+5.5 at Ramp A, except abutment fill	16 days	12SS,10SS+5 days,14,7SS+5	16SS
14	Stone columns Ramp A Bridge (Q.14)	4 days		13,16,15
15	West Abutment Fill Ramp A	4 days	14	16
16	Ramp A, West Abutment	60 days	13SS,14,15	18
17	Ramp A, East Abutment, pt. A to pt. C, S. of Grading E21st to Ramp A	20 days		18
18	Ramp A Superstructure	30 days	19,16,17	
19	Grading of Mainline from Unv. Ramp A to E21st Bridge 572+80 to 572+40	4 days	20,24SS,5	18
20	Parcel 117 Work	20 days		19,24
21	Stone Columns West side E 21st Bridge (Q.15)	6 days	5,29	23
22	Stone columns East side E 21st Bridge (Q.15)	12 days	29,5	26

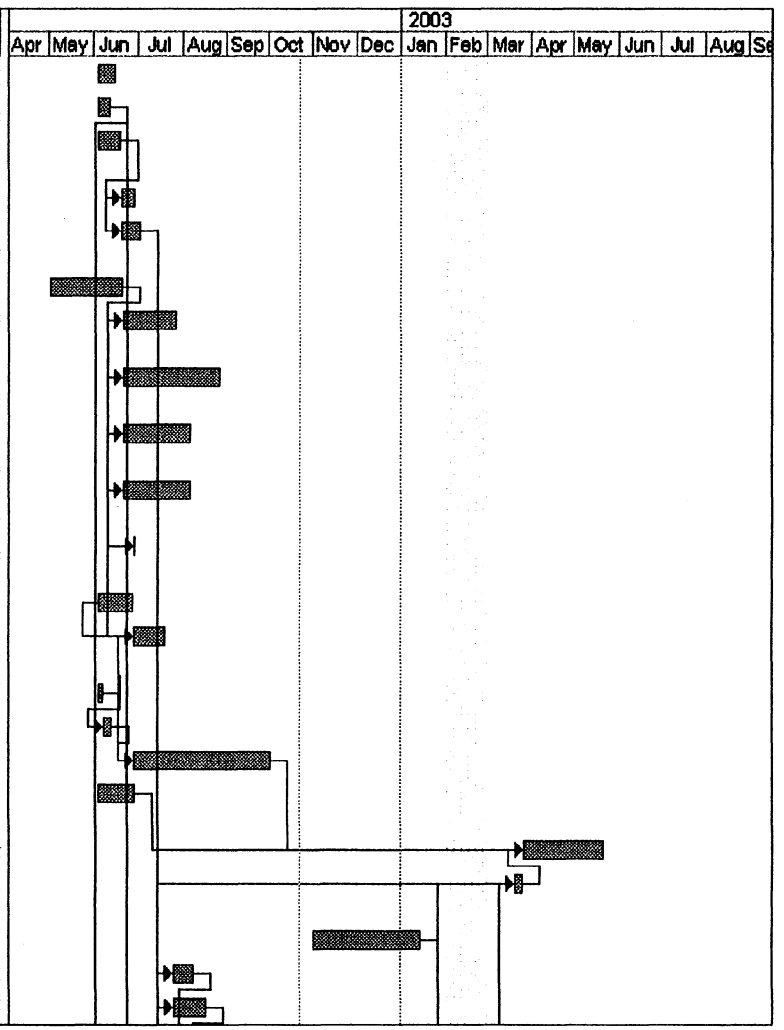


Figure 14: University Avenue Detailed Schedule

	Task Name	Duration	Predecessors	Successors
23	Sheet Piles for Wall #5881 & MSE Wall #5808 at E21st St West Abutment (D.01 D.02 Q.09 V.10 V.13 V.33 X.09-17)	10 days	21	24
24	MSE Wall #5808 at E21st St. West Abutment (D.02 Q.09 V.10 V.13 V.33 X.09 - 17)	40 days	20,23	19SS,25
25	E 21st Bridge	60 days	24,27	
26	Sheet Piles for Wall #5882 & MSE Wall #5807 at E21st St East Abutment (D.02 Q.10 V.10 V.12 V.33 X.09 - 17)	10 days	22	27
27	MSE Wall #5807 at E21st S.t East Abutment (D.02 Q.10 V.10 V.12 V.33 X.09 - 17)	29 days	26	28SS,25
28	Grading of Mainline from E21st Bridge to Easton Bridge	13 days	27SS,30,31,32,36SS,29	
29	Storm sewer abandonment in E21st St. area	10 days	30,31	21,22,35,28
30	Storm Sewers (88504) at E21st St M.22	2 days		29,40,28
31	Storm Sewer (88008, 88011, 88009) in between E21st St and Easton Blvd (J.01 J.03 J.04 M.19 M.26)	28 days		29,28
32	Storm Sewer (88007) at Easton Blvd. (M.20 M.22)	8 days		36,28,40,35
33	Storm Sewer (88006) at Easton Blvd (M.20 M.23)	3 days		40,42,41,43
34	Storm Sewer (88004, 88005,88003,88002,88001) north of Easton Blvd (M.20 -25)	33 days		42,43
35	Sheet Piles for Wall #5883 & MSE Wall #5820 at Easton Blvd. South side (D.02 Q.11 V.10 V.14 V.34 X.02 - 07)	5 days	2,32,29	36
36	MSE Wall #5820 at Easton Blvd. South Abutment (D.02 Q.11 V.10 V.14 V.34 X.02 - 07)	25 days	35,32	40SS,28SS,38
37	Easton Bridge, North Abutment	40 days	42	39
38	Easton Bridge, South Abutment	40 days	36	39
39	Easton Bridge Superstructure	45 days	37,38	

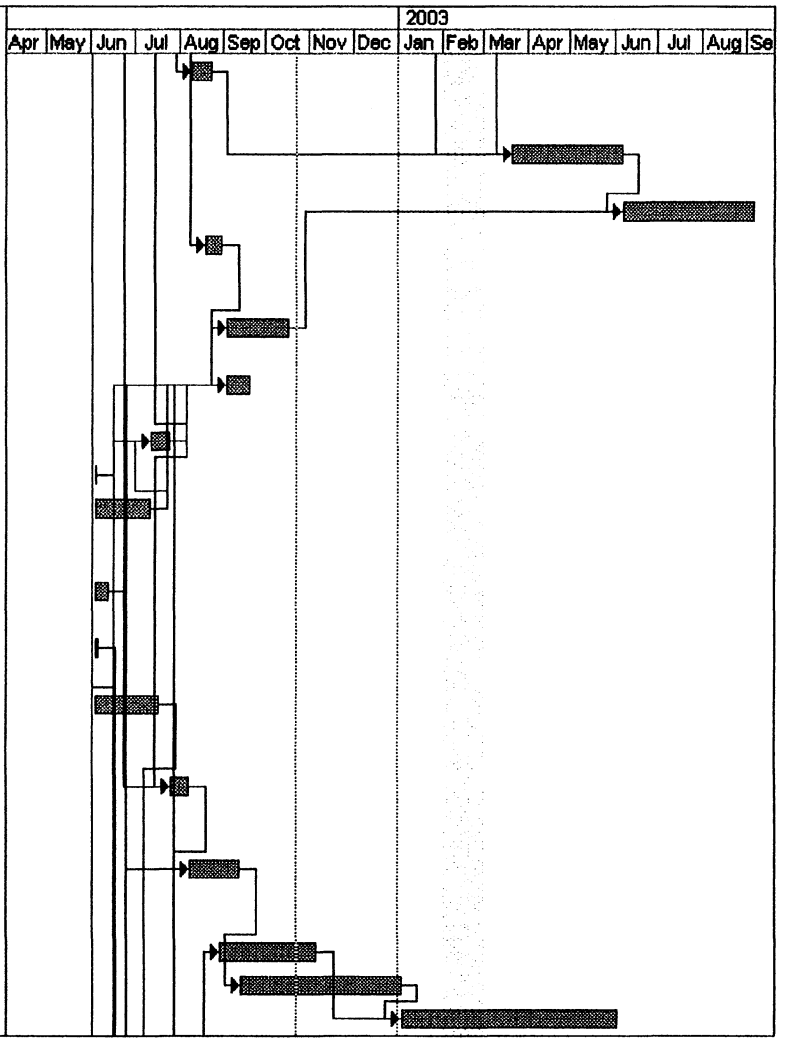


Figure 14: University Avenue Detailed Schedule (continued)

	Task Name	Duration	Predecessors	Successors
40	Grading at Easton Blvd.	1 day	30,32,33,36SS	42SS
41	Sheet Piles for Wall #5684 & MSE Wall #5822 at Easton Blvd. North Abutment (D.02 Q.12 V.10 V.15 V.34 X.02 - 07)	6 days	2,33	42
42	MSE Wall #5822 at Easton Blvd. North Abutment (D.02 Q.12 V.10 V.15 V.34 X.02 - 07)	15 days	40SS,41,33,34	44SS,37
43	MSE Wall #5824 north of Easton Blvd. NW side (D.02 D.03 Q.13 V.10 V.16 W.29 - 40)	41 days	33,34	44SS
44	Grading of Mainline from Easton Bridge to End of Project	9 days	42SS,43SS,45,50	51
45	Washington Ped Bridge Removal	5 days		44
46	Install 100 mm pipe Alpha Ave. (M.06 M.07)	8 days		47,49
47	Install pump for Alpha Ave. (M.06 M.07)	4 days	46	49
48	New Sanitary Sewer, N. Tichenor St. (456) (M.04 M.05)	4 days	2	49
49	Start pumping sewage Tichenor St.	1 day	46,47,48	50
50	Abandon Tichenor St. sewer	8 days	49	44
51	Clean up	5 days	44	

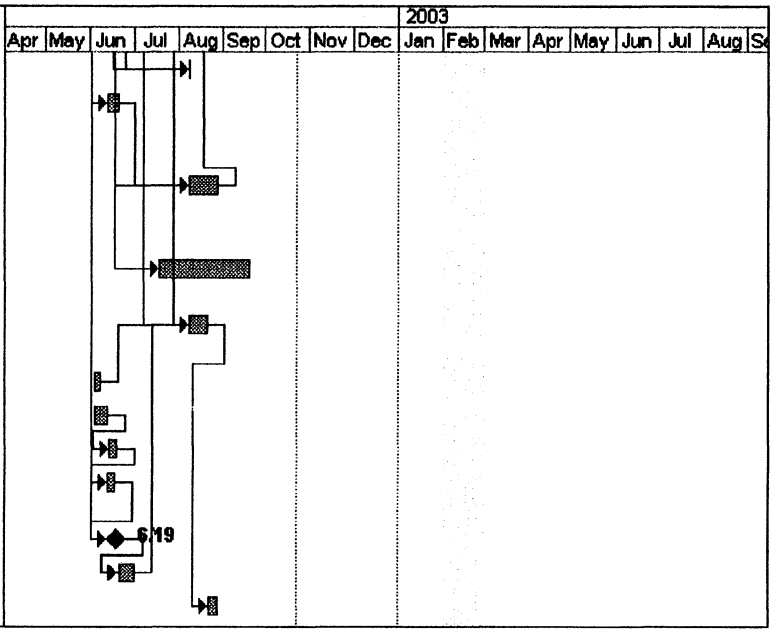


Figure 14: University Avenue Detailed Schedule (continued)

Also included in the schedule as tasks are several projects that weren't tied to the contract of the grading project, such as a storm/sanitary sewer project (458) and another storm/sanitary sewer project (456) on lines 6 and 48, respectively. Rather, the 458 and 456 projects were determined by or affected the grading project and thus needed to be included in the detailed schedule.

Next, quantity take-offs were performed. The quantity take-offs were done by using the design plans. In some cases, the quantities were detailed in a table, such as for the sewers or the waterline. The lengths for each segment of pipe were given. For the grading, sheets in the plans called "T-sheets" allowed volume of cut or fill to be calculated for the segmented tasks. The quantities measured for bridges were the area of the decks, because the DOT uses areas to determine working days. Surface area was also the quantity taken off for the soil nail walls and MSE walls. Other quantities, such as clear and grubbing and pavement removal were found in the total project quantities table of the design plans.

From the quantities, durations were then calculated. The calculations were based upon productivity rates from calculations based upon input from a grading contractor or from DOT specifications.

Logical relationships also had to be determined between the tasks. This means determining successors and predecessors for activities. One does this by asking what has to occur before a certain task can be performed. Some of the relationships are a part of normal construction progression, others were project specific. For example, there was a parcel of land that the DOT didn't get access to

until the owner moved on November 1. This situation prevented work from being done on the land until after this date.

The tasks, durations, and logic were inputted into the scheduling program, Microsoft Project. The format can be customized. The format of the Figure 14 shows the tasks, durations, predecessors, successors, and the Gantt bar chart. The schedule also has a notes section, which contains the quantities, productivity rates, and assumptions made in case one wishes to see how a duration was calculated or a relationship was made.

CHAPTER 4:

OTHER SCHEDULING NEEDS OF A PUBLIC AGENCY

One need of the DOT that materialized during the course of this project is for documents to be made that summarize information from various departments in the DOT. With state budget cuts, the Iowa DOT had a reduction in the number of employees, especially highly experienced employees. Some people lost their jobs, others were offered early retirement. Some of the vacant positions were filled; other positions were eliminated. People also transferred from department to department to fill vacant positions. Some of the positions were filled with individuals fresh out of college. The adjustment period to the staffing changes seemed to reduce productivity. The time employees had was primarily used to focus on the tasks of the department. There was not as large of an opportunity to collect information from the many different departments working on the I-235 project and to summarize it.

The design section for the I-235 project began the project by creating and occasionally updating two different visual summaries supplied by the Iowa DOT using MicroStation. The first files showed the staging from year to year strictly by color. The intersection designs and bridge locations are shown. Projects though are not identified nor are specific letting dates. The various colors for this map led the designers to call it the "Rainbow Map." An excerpt is shown in Figure 15.

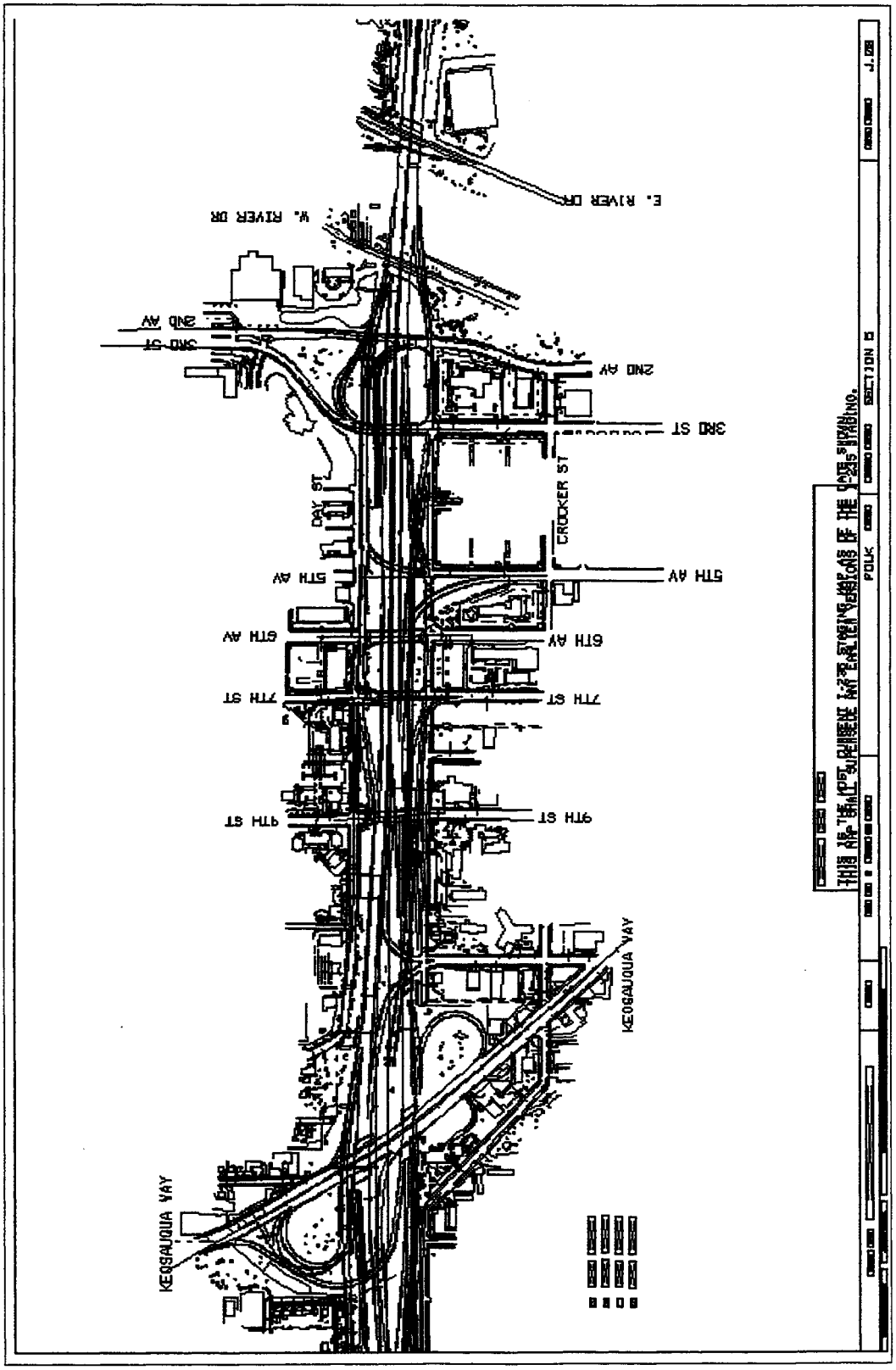


Figure 15: Excerpt from Rainbow Map

The second visual is called the staging map. Figure 16 shows an excerpt from this map. It also uses colors to show which fiscal year a project is let, but it goes into more detail. For example, the exact letting date is given along with the parentheses number of the project. The project name and cost information, when applicable, are noted in addition to the final design turn in date. The details of interchanges aren't given, but the visual does include the names of side roads.

These maps though became outdated. The latest version in circulation was over a year old. The project then hit a very busy point. So not only were projects in the preparation stage, projects were also in progress. Some projects were also pushed back creating some future letting dates with a very large number of projects. The DOT designers were overloaded with no calm in sight for the next four to five years.

So, the need of someone to work on a general summary, one that is visual, existed at this point. Other departments outside of design, such as the utilities section, valued this type of information summary. It was also suggested that another type of map be created that showed the entire I-235 project on one page. This visual would also include the project names and letting dates and pinpoint the location of such projects. The map would also include utility projects, which the other two visuals do not. Figure 17 shows the project summary visual.

One difference of utility projects compared to the other projects, especially when it's a storm or sanitary sewer, is that it is difficult to determine the project location from the project name. A lot of the sewer projects are on roads that run parallel to the interstate. The roads may run some distance, but the project is only

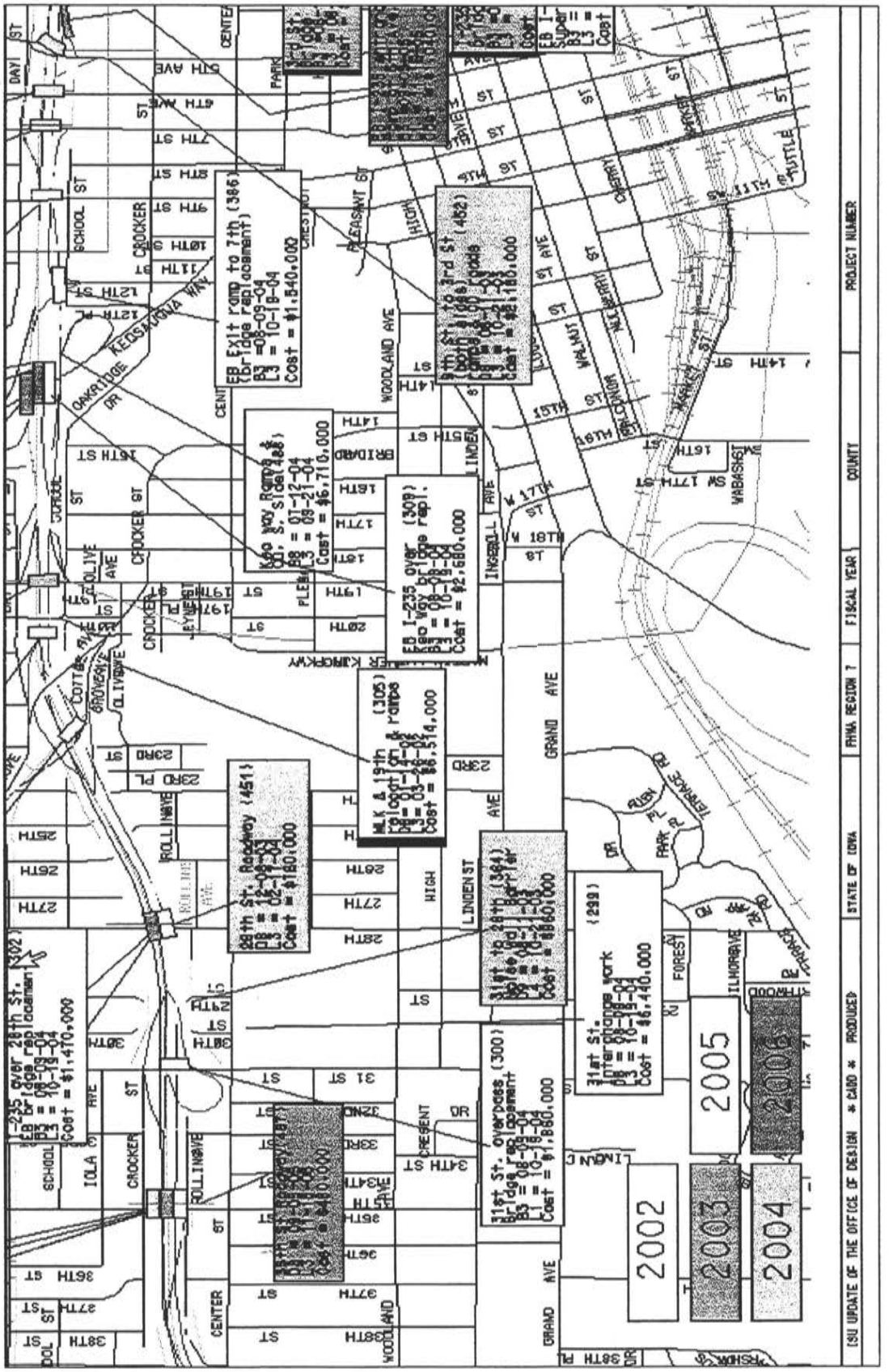


Figure 16: Excerpt from Staging Map

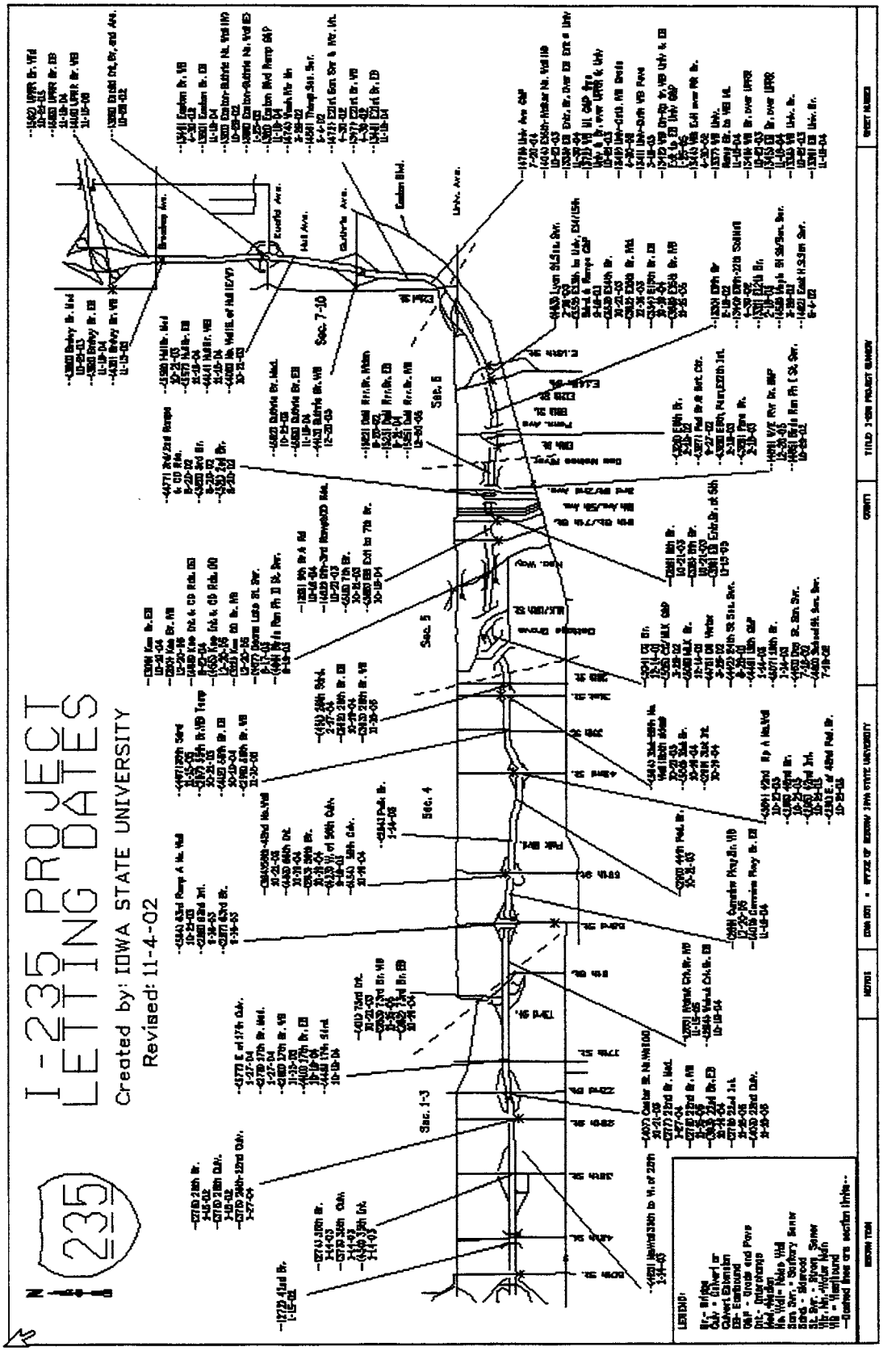


Figure 17: Project Summary Map

going to occur on one small segment. The name though oftentimes only refers to the side road. It does not give on which blocks the project is located, such as the Maple Street sanitary sewer project. This project is only taking place on Maple Street in between blocks of East 11th Street and East 12th Street. One though wouldn't know this from the project name. The project summary map would help other sections in the DOT besides the utility section in recognizing these projects.

Creating visual summaries of projects is very helpful in a large reconstruction project, such as the I-235 reconstruction. The DOT didn't have the resources to begin or continue work of this type. Rather their resources were occupied on the details of the job. That is where the ISU scheduling team was able to fill the gap. It was a perfect complement for the two teams. ISU didn't have the personnel or time resources to focus on the level of detail the DOT did, whereas the DOT didn't have the resources to put towards the general. The visual summaries will then aid in reducing the detail time and result in overall cost savings.

Another helpful aid was developing spreadsheet summaries of the project schedule. One type, shown in Appendix F, is sorted by the letting dates of the projects. This was helpful for the utility coordination team for they distributed the spreadsheet to utility companies that would be affected by the project. This then allows the companies to be informed on when certain projects were let and when certain locations would need to be clear of utility conflicts.

The other sorted spreadsheet is in Appendix G. This file was sorted by project parenthesis number. This was helpful for the DOT for it allowed the

employees to look up a letting date of a project quickly by using the reference number.

All of the reference aids mentioned above were helpful in providing references that summarized the entire I-235 project. This would be beneficial for any large project where information is constantly changing and outside organizations, such as utility companies, who plan their future work based upon information supplied by a DOT.

CHAPTER 5:

CONCLUSION

5.1 SUMMARY

Utilities are an important component in a construction project. Adequate time should be allowed to clear conflicts before highway construction occurs. If this doesn't occur, the project is at risk of delay. In construction, time is money. Utility-caused delays can therefore cost the owner and contractor a substantial amount of money.

In a large reconstruction project, such as the I-235 project, scheduling utilities is even more vital. Large reconstruction projects tend to continue over several years. Thus, delays in early years will cause delays throughout the entire project.

A precursor to scheduling utilities is an understanding of the cycle utilities go through. The cycle is made up of three components: identification, design, and construction. To successfully move through the cycle, communication and coordination must be present. There are many different ways for communication and coordination to be incorporated, such as through meetings between utility owners and highway agencies, pre-bid meetings involving contractors, utility companies and highway agency, or a five-year work plan.

Also, important to understand is the process or policies of the highway involved in a project. Stages in this process would include permitting and the lettings. Policies would involve issues such as right of way.

Understanding the utility cycle and the process and policies of the highway agency will allow one to better incorporate utilities in a project's schedule.

This researcher viewed the process of incorporating utilities into the schedule of I-235. There were several stages involved in the process: an initial stage, an updating stage, and a stage for a detailed schedule. In each of the stages, it was important to archive details of information, sources of information and any assumptions made. Archiving makes it easier for a team to respond to questions that may come up in the future. It also allows a project team to recover from losing a member more easily.

A need of a DOT was recognized in this project. It was that of supplying different summaries of project information. Visual and tabular summaries of project letting dates and locations were found to be very beneficial to not only the DOT but also utility companies and other state agencies.

5.2 RECOMMENDATIONS FOR FUTURE CONSTRUCTION PROJECTS

Below are recommendations for DOT's that are planning construction projects similar to I-235. The recommendations are based upon areas of the I-235 project that the author thought went well and areas that the author thought needed improvement. The author suggests that DOT's:

- *Provide information to utility companies on letting dates of projects*—The information should give the project location and be sorted in an easy-to-read format and be redistributed as major changes are made to the project schedule.

- *Incorporate utilities into preconstruction and construction schedules*—Due to activities that are involved in relocating utilities, such as ROW acquisition and permit approval, relocations have the potential to take several years from concept to completion. If adequate time is not put into a schedule for preconstruction locations, the entire project will be delayed. Utilities also have the potential to be part of construction. Just as with any construction work item, utilities should be activities in the schedule with durations and logic ties.
- *Establish a team of DOT employees to focus on utility coordination*—A utility coordinator is important to maintaining communication with utility companies, but a coordinator alone shouldn't perform the job. A support staff needs to be supplied to provide assistance in notifying utility companies and coordinating utility work. A staff would also provide an easier transition if the utility coordinator were to leave the position.
- *Involve utility companies in preconstruction and construction meetings*—This provides an arena allowing contractors to ask questions to the utility companies directly, decreasing the time and potential of miscommunication through a middle party. This also allows a time for schedule integration and for both sides to communicate their needs and availability of resources.
- *Setup meetings between design engineers, utility coordination team, and utility companies to coordinate utility relocations and abandonments before and throughout the project*—This allows the DOT and utility

companies to determine which utilities are conflicts to proposed construction. Utility companies will compare their records of utility locations with those of the DOT. Any utilities that are possible conflicts will be flagged, and further investigation will be performed. The DOT will also be informed when utility work has been completed and is no longer a conflict. Having design engineers present will add to the process in that they can provide information on the project's design.

- *Establish a utility policy manual*—The manual will detail rules and regulations for utility companies if they choose to do business with the DOT. It will also provide guidelines for utility placement. The policy should also include sample forms that are required for various DOT approvals and other types of documents that are used by the DOT for utility related business.
- *Archive information or correspondences related to utilities*—The information should be organized so that in the case of employee transition, a new employee would be able to access records easily. The information should be kept in a format that can be quickly updated, otherwise updating will not performed very frequently. Any archived decision, problem, or development would also help remind employees of the status of a utility. This is especially important when utility locations number into the thousands, with each being a potential conflict.

- *Setup online forms to collect information on utilities*—The forms can collect information from utility owners on the status of utility work and provide information on utility locations and utility company representatives.
- *Create project summaries*—The summaries should be references that allow one to look up the project location, project identification number, or project letting date quickly. The summaries should also be customized to fit users' needs in several spreadsheet and map formats.

5.3 RECOMMENDATIONS FOR FUTURE RESEARCH

Recommendations for future research would be to:

- Establish a database format for the DOT to use in collecting utility information
- Develop charts that give utility duration according to its characteristics such as size or depth. These would be similar to the charts the Iowa DOT uses to find the number of working days based upon a bridge's surface area.
- Develop a procedure to implement inputting accurate as-builts into a CADD system
- Develop an online system of collecting and supplying information from and to utility owners

APPENDIX A:

I-235 PROJECT RECONSTRUCTION SCHEDULE

	Task Name	Duration	Letting Dat	Start	Finish
1	**I-235**	**1763 days**	**NA**	**Fri 2/11/00**	**Fri 11/10/06**
2	**Section 1-3**	**1511 days**	**NA**	**Wed 12/27/00**	**Mon 10/9/06**
4	42nd St. Bridge (PPCB) Repl'mt., Approaches	65 days	Tue 1/15/02	Thu 3/21/02	Sun 7/14/02
7	**35th St. (PPCB)**	307 days	**NA**	**Fri 3/14/03**	**Fri 5/14/04**
8	Noise Wall (35th to W of 28th, S. side)	87 days	Tue 1/14/03	Fri 3/14/03	Mon 7/14/03
9	35th St. in WDsM, Interchange work	102 days	Tue 1/14/03	Tue 7/15/03	Fri 5/14/04
10	35th St. Bridge Repl'mt	50 days	Tue 1/14/03	Thu 3/20/03	Thu 6/19/03
12	35th St. Culvert Extension	60 days	Tue 1/14/03	Thu 3/20/03	Wed 7/9/03
23	**28th St.**	**653 days**	**NA**	**Tue 1/15/02**	**Thu 7/15/04**
24	Culvert Extension (28th St.)	*40 days*	Tue 1/15/02	Wed 3/20/02	Thu 6/6/02
25	Culvert Extension (28th St. to 22nd St.)	60 days	Tue 1/27/04	Mon 3/29/04	Thu 7/15/04
26	28th St. Bridge (PPCB) Repl'mt., incl. Approaches	65 days	Tue 1/15/02	Mon 7/15/02	Wed 10/23/02
29	**22nd St. (PPCB)**	**696 days**	**NA**	**Thu 1/15/04**	**Wed 9/13/06**
30	Center St. Noise Wall (N. Side)	40 days	Tue 10/21/03	Thu 1/15/04	Fri 5/21/04
31	22nd St. Median Bridge widening	85 days	Tue 1/27/04	Mon 3/29/04	Thu 8/19/04
32	22nd St. WB ML Bridge Repl'mt.	115 days	Tue 11/15/05	Mon 1/16/06	Wed 9/13/06
33	22nd St. EB ML Bridge Repl'mt.	115 days	Tue 10/19/04	Mon 1/17/05	Mon 9/12/05
34	22nd St. Interchange work (22nd St. and ramps)	87 days	Tue 11/15/05	Wed 3/22/06	Fri 8/18/06
35	Culvert Extension at 22nd St.	60 days	Tue 11/15/05	Mon 1/16/06	Thu 6/8/06
49	**17th St. (PPCB)**	**634 days**	**NA**	**Mon 3/29/04**	**Wed 8/30/06**
50	Culvert Extension (E of 17th)	60 days	Tue 1/27/04	Mon 3/29/04	Thu 7/15/04
51	17th St. Median Bridge widening	82 days	Tue 1/27/04	Mon 3/29/04	Mon 8/16/04
52	17th St. WB ML Bridge Repl'mt. (WDsM)	105 days	Tue 11/15/05	Mon 1/16/06	Wed 8/30/06
53	17th St. EB ML Bridge Repl'mt. (WDsM)	105 days	Tue 10/19/04	Mon 1/17/05	Wed 8/24/05

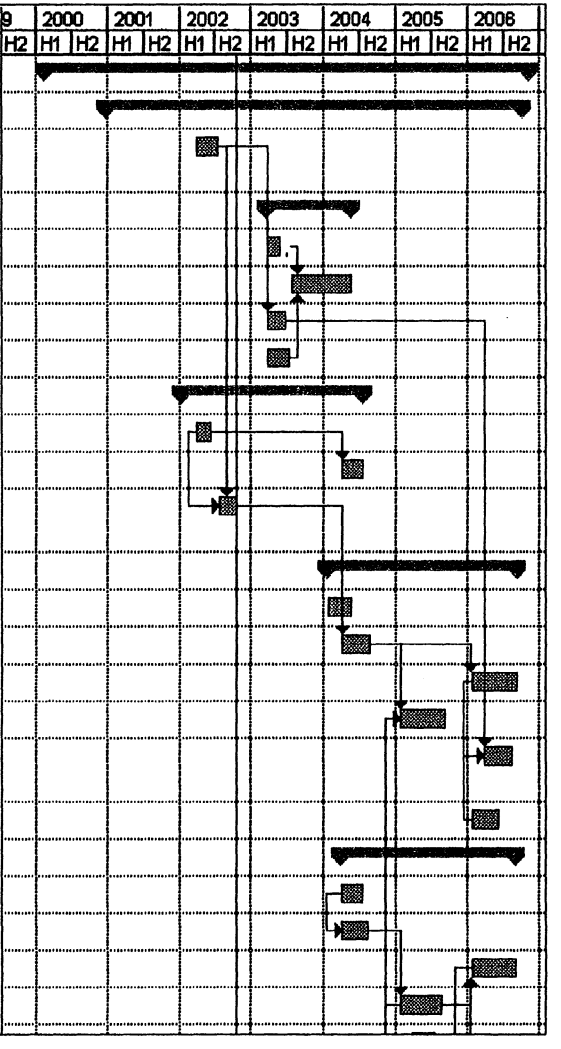


Figure 18: Schedule for I-235 Reconstruction

	Task Name	Duration	Letting Dat	Start	Finish
54	17th St. Sideroad reconstruction	70 days	Tue 10/19/04	Tue 3/22/05	Wed 7/20/05
60	**73rd St. (PPCB)**	**667 days**	**NA**	**Mon 3/22/04**	**Mon 10/9/06**
61	73rd St. Interchange, loop & ramp resurf (6") - both sides	100 days	Tue 10/21/03	Mon 3/22/04	Mon 9/6/04
62	WB ML Bridge Widen / Redeck	130 days	Tue 11/15/05	Mon 1/16/06	Mon 10/9/06
63	EB ML Bridge Widen / Redeck	110 days	Tue 10/19/04	Mon 1/17/05	Mon 9/5/05
75	**Section 4**	**1360 days**	**NA**	**Wed 8/29/01**	**Fri 11/10/06**
76	Walnut Creek WB Bridge Widen / Redeck	140 days	Tue 11/15/05	Mon 1/16/06	Mon 10/23/06
77	Walnut Creek EB Bridge Widen / Redeck	140 days	Tue 10/19/04	Mon 1/17/05	Fri 10/21/05
78	**63rd St. (PPCB)**	**207 days**	**NA**	**Thu 1/15/04**	**Fri 10/29/04**
79	Noise Wall (63rd St. Ramp A)	70 days	Tue 10/21/03	Thu 1/15/04	Thu 7/8/04
80	63rd St. Interchange work	52 days	Tue 9/16/03	Mon 3/22/04	Thu 6/24/04
81	63rd St. Bridge Work	140 days	Tue 9/16/03	Thu 1/15/04	Fri 10/22/04
83	**Cummins Pkwy (PPCB)**	**476 days**	**NA**	**Mon 1/17/05**	**Fri 11/10/06**
84	WB Bridge Repl'mt	140 days	Tue 12/20/05	Wed 3/22/06	Fri 11/10/06
85	EB Bridge Repl'mt	140 days	Tue 11/16/04	Mon 1/17/05	Fri 10/21/05
86	**56th St. (PPCB)**	**528 days**	**NA**	**Thu 1/15/04**	**Fri 1/20/06**
87	56th to 42nd Noise Wall Barrier	30 days	Tue 10/21/03	Thu 1/15/04	Fri 4/30/04
88	Interchange reconstruction	25 days	Tue 10/19/04	Tue 3/22/05	Fri 5/13/05
89	Bridge Repl'mt	152 days	Tue 10/19/04	Mon 1/17/05	Fri 11/11/05
91	Culvert Extension (56th St.)	60 days	Tue 10/19/04	Mon 1/17/05	Tue 6/7/05
92	Culvert Extension (0.25 km W of 56th)	60 days	Tue 9/16/03	Thu 1/15/04	Tue 6/8/04
93	**Polk Blvd Bridge**	**177 days**	**NA**	**Wed 1/1/03**	**Thu 9/4/03**
95	Polk Blvd overpass, 2 bridges, approaches	100 days	Tue 1/14/03	Thu 3/20/03	Thu 9/4/03
100	Pedestrian Overpass at 44th St.	98 days	Tue 10/21/03	Thu 1/15/04	Tue 8/17/04
102	**42nd St. (PPCB)**	**213 days**	**NA**	**Mon 1/19/04**	**Wed 11/10/04**
103	Noise Wall (42th St. Ramp A)	30 days	Tue 10/21/03	Mon 1/19/04	Tue 5/11/04

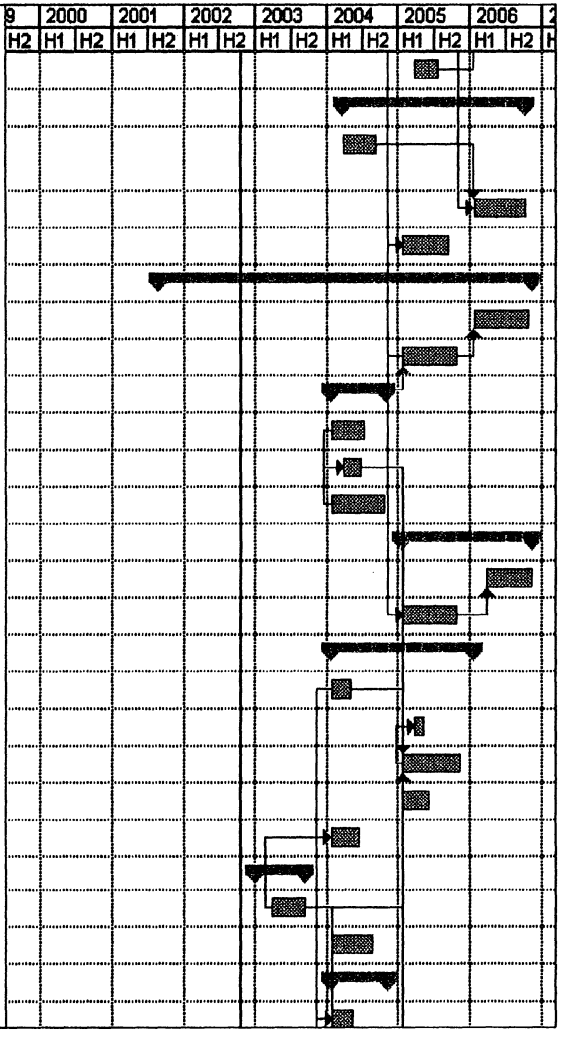


Figure 18: Schedule for I-235 Reconstruction (continued)

	Task Name	Duration	Letting Dat	Start	Finish
104	42nd Bridge Repl'mt	143 days	Tue 10/21/03	Mon 1/19/04	Wed 11/3/04
106	Interchange reconstruction	135 days	Tue 10/21/03	Mon 3/22/04	Wed 11/3/04
107	Pedestrian Overpass E of 42nd St.	98 days	Tue 10/21/03	Mon 1/19/04	Thu 8/19/04
108	**35th St. (PPCB)**	**675 days**	**NA**	**Thu 1/15/04**	**Tue 8/15/06**
109	35th St. Sideroad Reconstruction	70 days	Tue 11/15/05	Wed 3/22/06	Thu 7/20/06
110	WB ML Bridge Widening (temporary)	30 days	Tue 10/21/03	Thu 1/15/04	Fri 4/30/04
111	EB ML Bridge Repl'mt	111 days	Tue 10/19/04	Mon 1/17/05	Tue 9/6/05
112	WB ML Bridge Repl'mt	90 days	Tue 11/15/05	Fri 1/20/06	Tue 8/15/06
119	**31st St (PPCB)**	**525 days**	**NA**	**Mon 1/19/04**	**Thu 1/19/06**
120	Noise Wall (31st to 28th, both side)	30 days	Tue 10/21/03	Mon 1/19/04	Tue 5/11/04
121	**31st St. Bridge**	**275 days**	**NA**	**Mon 1/3/05**	**Thu 1/19/06**
123	31st St. Bridge Repl'mt	152 days	Tue 10/19/04	Fri 1/21/05	Thu 1/19/06
124	Interchange reconstruction	57 days	Tue 10/19/04	Tue 3/22/05	Thu 6/30/05
126	**28th St. (PPCB)**	**624 days**	**NA**	**Mon 4/19/04**	**Wed 9/6/06**
127	28th St. Sideroad Reconstruction	65 days	Tue 2/17/04	Mon 4/19/04	Thu 7/29/04
128	EB ML Bridge Repl'mt	126 days	Tue 10/19/04	Mon 1/17/05	Mon 10/3/05
129	WB ML Bridge Repl'mt	110 days	Tue 11/15/05	Mon 1/16/06	Wed 9/6/06
133	**Section 5**	**1763 days**	**NA**	**Fri 2/11/00**	**Fri 11/10/06**
134	**Cottage Grove**	**158 days**	**NA**	**Wed 2/27/02**	**Fri 10/4/02**
135	**Cottage Bridge**	**140 days**	**NA**	**Wed 2/27/02**	**Tue 9/10/02**
136	Bridge Construction	140 days	Fri 12/14/01	Wed 2/27/02	Tue 9/10/02
138	Cottage Grove -- MLK (G _P)	100 days	Tue 3/26/02	Mon 4/29/02	Fri 10/4/02
149	**MLK Pkwy (Steel)**	**194 days**	**NA**	**Thu 3/7/02**	**Wed 12/4/02**
150	**MLK Blvd bridge repl'mt**	**175 days**	**Fri 12/14/01**	**Thu 3/7/02**	**Thu 11/7/02**
154	**MLK Blvd Bridge Construction**	**175 days**	**Fri 12/14/01**	**Fri 3/8/02**	**Thu 11/7/02**
168	**19th St.**	**206 days**	**NA**	**Thu 3/20/03**	**Wed 12/31/03**
169	19th St. GP	140 days	Tue 1/14/03	Thu 3/20/03	Wed 12/31...

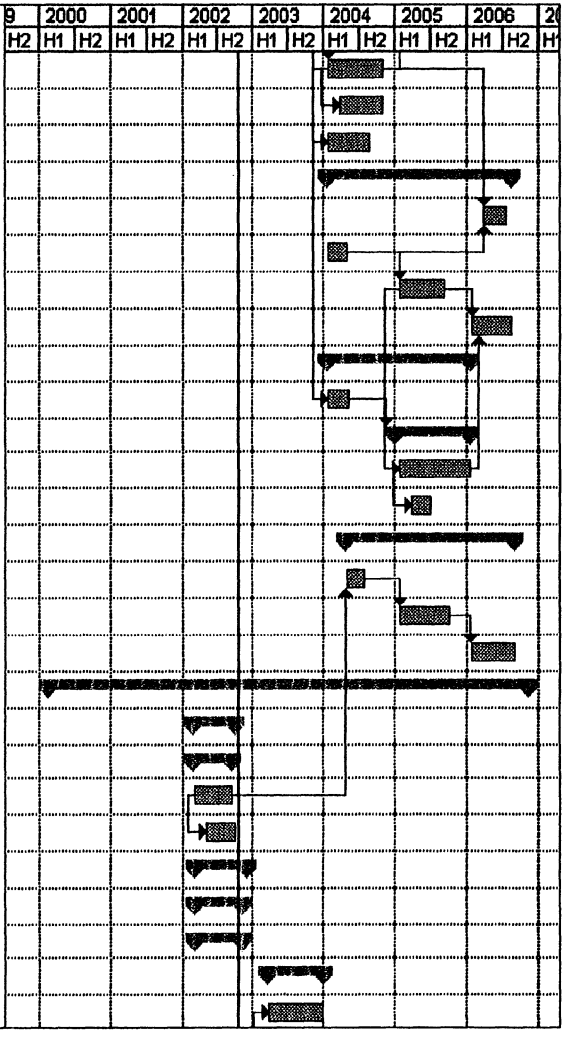


Figure 18: Schedule for I-235 Reconstruction (continued)

	Task Name	Duration	Letting Dat	Start	Finish
170	**19th Bridge**	**135 days**	**NA**	**Thu 3/20/03**	**Wed 9/24/03**
171	19th St. Bridge Construction, incl. 2 ret. Walls & MLK Bridge removal	100 days	Tue 1/14/03	Thu 3/20/03	Thu 9/4/03
174	**Keo Way**	**587 days**	**NA**	**Tue 7/20/04**	**Tue 10/17/06**
175	**EB ML Bridge (Steel) Repl'mt.**	**288 days**	**Tue 10/19/04**	**Tue 7/20/04**	**Thu 8/25/05**
183	**WB ML Bridge (Steel) Repl'mt.**	**326 days**	**Tue 12/20/05**	**Wed 7/20/05**	**Tue 10/17/06**
191	Keo Way Interchange & CD Roads (S. side)	114 days	Tue 9/21/04	Tue 3/22/05	Fri 9/23/05
192	Keo Way Interchange _CD Roads (N. side)	98 days	Tue 12/20/05	Wed 3/22/06	Mon 9/4/06
193	WB CD Bridge over Keo Way, Repl'mt.	108 days	Tue 12/20/05	Wed 3/22/06	Mon 9/18/06
198	**9th St. Bridge (Steel) Repl'mt & Roadways**	**219 days**	**Tue 10/19/04**	**Wed 10/20/04**	**Mon 8/22/05**
213	9th St to 3rd St. (both sides) ramps & CD roads	80 days	Tue 10/21/03	Mon 3/22/04	Thu 8/5/04
214	**7th St. Bridge (Steel) Repl'mt., incl. Approach & 2 ret. Walls**	**285 days**	**Tue 10/21/03**	**Mon 7/21/03**	**Thu 8/19/04**
223	**6th Ave. Bridge (Steel) Repl'mt.(incl. Bridge removal)**	**285 days**	**Tue 10/21/03**	**Mon 7/21/03**	**Thu 8/19/04**
232	**5th St. Bridge (Steel) Repl'mt. & roadways**	**189 days**	**Tue 10/21/03**	**Tue 10/21/03**	**Fri 7/9/04**
242	EB Exit ramp to 7th (bridge repl'mt)	152 days	Tue 10/19/04	Mon 1/17/05	Fri 11/11/05
243	EB Entrance at 5th Ave (Bridge Repl'mt.) [Tunnel]	150 days	Tue 11/15/05	Mon 1/16/06	Fri 11/10/06
248	**3rd St.**	**252 days**	**NA**	**Tue 8/20/02**	**Thu 8/7/03**
249	3rd St. Ramps & CD roads (both sides W of 3rd), 2nd St. r-walls, School St.	89 days	Tue 8/20/02	Mon 10/21/02	Mon 8/4/03
250	**3rd St. Bridge (Steel) Repl'mt**	**246 days**	**Tue 8/20/02**	**Tue 8/20/02**	**Wed 7/30/03**
260	**2nd Ave.**	**252 days**	**NA**	**Tue 8/20/02**	**Thu 8/7/03**
261	**2nd Ave. Bridge (Steel) Repl'mt.,**	**246 days**	**Tue 8/20/02**	**Tue 8/20/02**	**Wed 7/30/03**

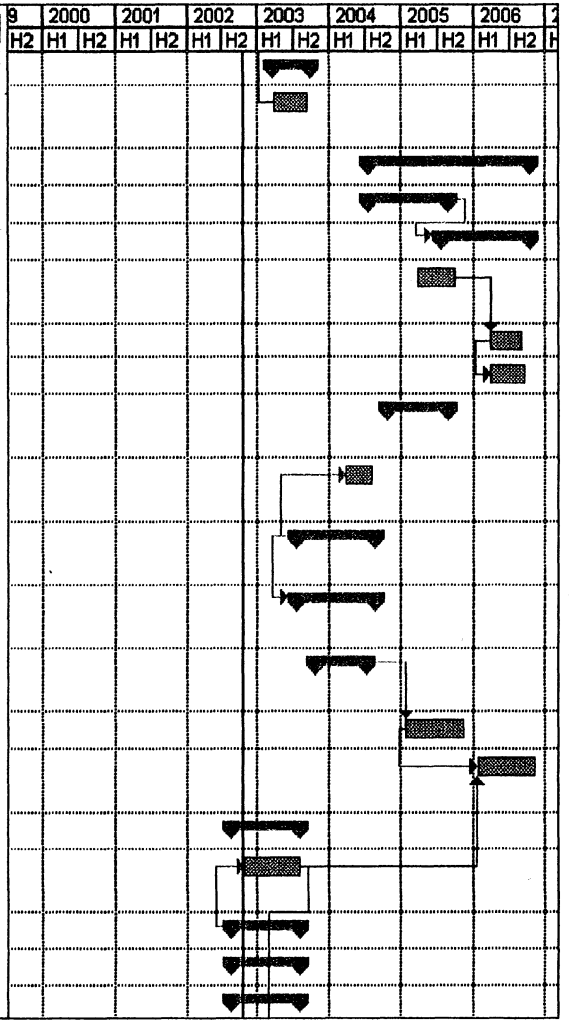


Figure 18: Schedule for I-235 Reconstruction (continued)

	Task Name	Duration	Letting Dat	Start	Finish
269	GP W/E River Drive	70 days	Tue 12/20/05	Wed 3/22/06	Thu 7/20/06
272	**DsM Rvr Bridge (Steel)**	**965 days**	**NA**	**Wed 1/15/03**	**Fri 9/22/06**
273	Bridge widening (WB/EB) Ramp & ML over DsM River	140 days	Tue 8/20/02	Wed 1/15/03	Wed 10/22/03
274	**EB Bridge, Superstructure Repl'mt.**	**249 days**	**Tue 9/21/04**	**Tue 9/21/04**	**Mon 9/5/05**
280	**WB Bridge, Superstructure Repl'mt.**	**199 days**	**Tue 12/20/05**	**Tue 12/20/05**	**Fri 9/22/06**
304	**Sec 6**	1623 days	**NA**	**Wed 4/19/00**	**Wed 7/5/06**
305	**E6th St Bridge Repl'mt (Steel)**	**352 days**	**Tue 2/19/02**	**Tue 1/1/02**	**Wed 5/7/03**
317	**Pesestrian Overpass at Botanical Cntr**	**203 days**	**Fri 9/27/02**	**Wed 11/27/02**	**Fri 9/5/03**
325	E 6th / Penn. Ave., E 12th Interchange work	90 days	Tue 2/18/03	Tue 5/13/03	Mon 9/15/03
333	**Penn Ave Overpass Bridge (Steel), approaches**	**244 days**	**Tue 2/18/03**	**Wed 11/27/02**	**Mon 11/3/03**
343	**E9th St bridge Repl'mt (Steel)**	**284 days**	**Tue 2/19/02**	**Tue 2/19/02**	**Mon 3/24/03**
348	**E9th St bridge Conetruction**	**224 days**	**Tue 2/19/02**	**Wed 5/15/02**	**Mon 3/24/03**
352	Soilnail Walls (E 9th to E 12th)	45 days	Tue 4/30/02	Mon 7/1/02	Fri 8/30/02
373	**E12th St Bridge Repl'mt (Steel), incl. Soil nail wall at bridge**	**238 days**	**Tue 2/18/03**	**Thu 12/12/02**	**Mon 11/10/03**
387	Ramps G&P, E 13th to Univ. & E 14th/ E 15th sideroads	35 days	Tue 9/16/03	Mon 11/17/03	Thu 1/1/04
394	**E14th St Bridge (Steel) Repl'mt**	**219 days**	**Tue 10/21/03**	**Tue 10/21/03**	**Fri 8/20/04**
405	E 15th St Bridge Widening	110 days	Tue 12/16/03	Mon 3/22/04	Mon 9/20/04
410	E 15th St Bridge EB Repl'mt.	123 days	Tue 10/19/04	Mon 1/17/05	Thu 9/22/05
411	E 15th St Bridge WB Repl'mt.	123 days	Tue 11/15/05	Mon 1/16/06	Wed 7/5/06
414	**Sec 7, 8-10**	**1751 days**	**NA**	**Tue 2/29/00**	**Fri 11/10/06**
415	**Univ Ave Area**	**1026 days**	**NA**	**Tue 1/1/02**	**Mon 12/5/05**
416	Reconstruct Univ. Ave.	130 days	Tue 7/20/04	Mon 9/20/04	Thu 9/1/05
417	Noise Wall from E 16th to Walker (N side)	70 days	Tue 10/21/03	Thu 1/15/04	Thu 7/8/04

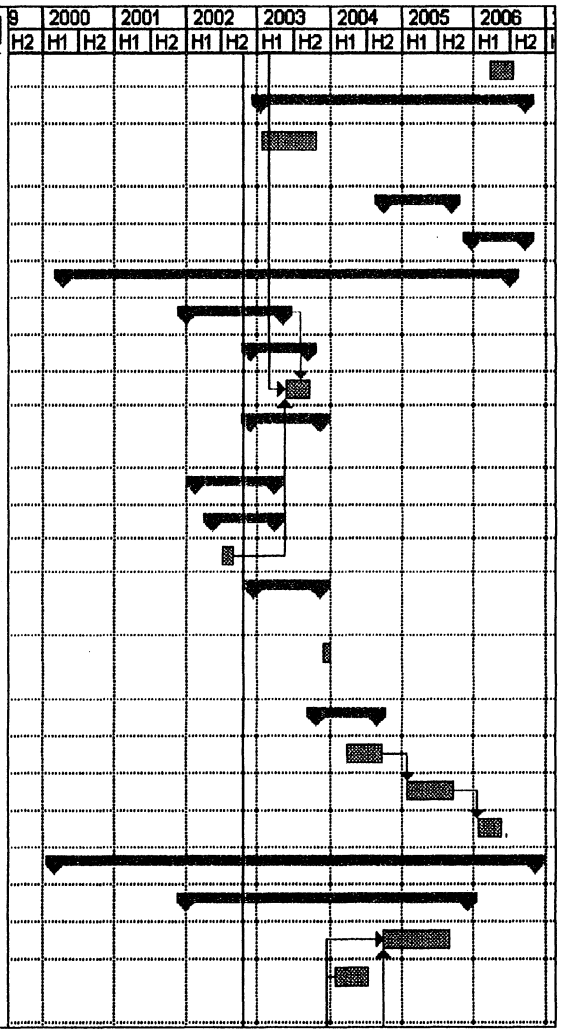


Figure 18: Schedule for I-235 Reconstruction (continued)

	Task Name	Duration	Letting Dat	Start	Finish
418	EB Entr. Bridge over EB Exit at Univ. [Tu	82 days	Tue 11/30/04	Tue 3/22/05	Fri 8/5/05
419	WB ML G&P thru Univ. Int (incl Bridge over Univ & UPRR, different contractors)	185 days	Tue 10/21/03	Tue 3/22/05	Mon 12/5/05
423	WB Grading - Univ. to Guthrie	100 days	Tue 4/30/02	Thu 7/4/02	Mon 4/28/03
424	WB Paving - Univ. to Guthrie	114 days	Tue 3/18/03	Mon 5/19/03	Wed 11/12/03
425	Ramp G&P WB to (& entr. From)WB Univ., EB Exit to Univ.	110 days	Tue 1/25/05	Fri 3/25/05	Thu 9/22/05
426	WB Exit at Univ. Bridge (over RR) Repl'mt.	70 days	Tue 4/30/02	Mon 7/1/02	Wed 10/16/02
427	WB Univ. Ave. ramp to WB I-235 bridge [Tunnel]	82 days	Tue 11/16/04	Tue 3/22/05	Fri 8/5/05
428	WB Bridge over UPRR, Repl'mt.	125 days	Tue 10/21/03	Thu 1/15/04	Fri 10/1/04
429	EB Bridge over UPRR, Repl'mt.	131 days	Tue 11/16/04	Mon 1/17/05	Mon 10/10/05
430	**WB Univ. Bridge Repl'mt. (Steel)**	**279 days**	**Tue 10/21/03**	**Wed 7/30/03**	**Fri 8/20/04**
439	**EB Univ. Bridge Repl'mt. (Steel)**	**284 days**	**Tue 11/16/04**	**Wed 8/25/04**	**Mon 9/26/05**
449	E 21 St. WB Bridge (PCCB) Repl'mt.	112 days	Tue 4/30/02	Mon 8/26/02	Tue 6/24/03
451	E 21 St. EB Bridge (PCCB) Repl'mt. - incl. Ramp bridge	112 days	Tue 11/16/04	Fri 1/21/05	Tue 9/13/05
467	**Noise Wall**	**657 days**	**NA**	**Wed 1/15/03**	**Wed 7/20/05**
468	Easton to Guthrie Noise Wall (W side)	70 days	Tue 10/29/02	Wed 1/15/03	Wed 7/9/03
469	Easton to Guthrie Noise Wall (E side)	70 days	Tue 1/25/05	Tue 3/22/05	Wed 7/20/05
478	Easton Blvd. ramps GP	48 days	Tue 11/16/04	Tue 3/22/05	Fri 6/17/05
479	**Easton WB Bridge (Steel) - New, Incl. Pedestrian Overpass at Washington,**	**240 days**	**Tue 4/30/02**	**Tue 1/22/02**	**Mon 12/23/02**
480	Pedestrian Overpass at Washington, Removal	5 days	Tue 4/30/02	Mon 7/29/02	Fri 8/2/02
488	**Easton EB Bridge (Steel) - New**	**276 days**	**Tue 11/16/04**	**Wed 8/25/04**	**Wed 9/14/05**
496	**Guthrie Ave. (PPCB)**	**699 days**	**NA**	**Thu 1/15/04**	**Mon 9/18/06**
497	Median Bridge	82 days	Tue 10/21/03	Thu 1/15/04	Mon 7/26/04
498	EB Bridge Repl'mt.	105 days	Tue 11/16/04	Mon 1/17/05	Wed 8/24/05

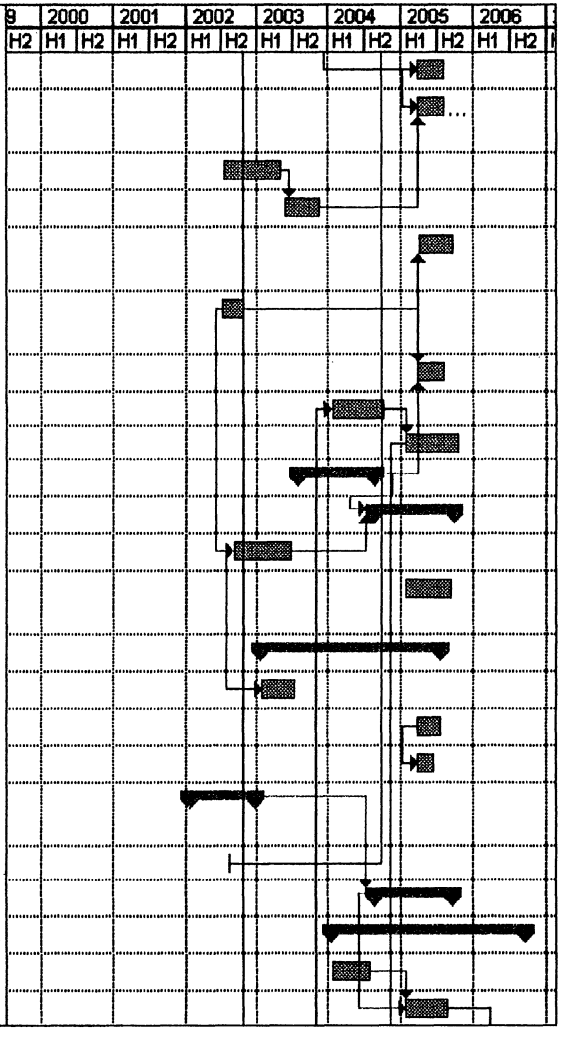


Figure 18: Schedule for I-235 Reconstruction (continued)

	Task Name	Duration	Letting Dat	Start	Finish
499	WB Bridge Repl'mt.	108 days	Tue 12/20/05	Wed 3/22/06	Mon 9/18/06
515	**Hull Ave. (PPCB)**	**704 days**	**NA**	**Thu 1/15/04**	**Mon 9/25/06**
516	Median Bridge	97 days	Tue 10/21/03	Mon 3/22/04	Wed 9/1/04
517	EB Bridge Repl'mt.	120 days	Tue 11/16/04	Mon 1/17/05	Mon 9/19/05
518	WB Bridge Repl'mt.	123 days	Tue 11/15/05	Mon 1/16/06	Mon 9/25/06
519	Noise Wall - S. of Hull Ave. (E. side, Morton to Sheridan)	80 days	Tue 10/21/03	Thu 1/15/04	Thu 7/22/04
520	Noise Wall - S. of Hull Ave. (W. side)	80 days	Tue 10/21/03	Thu 1/15/04	Thu 7/22/04
523	Euclid Ave. Interchange Resurfacing, Bridge Repl'mt., Euclid Ave. Reconstruction	150 days	Tue 10/29/02	Wed 1/15/03	Wed 11/12/03
525	**Broadway Ave. (PPCB)**	**691 days**	**NA**	**Thu 1/15/04**	**Wed 9/6/06**
526	Median Bridge Widening	100 days	Tue 10/21/03	Thu 1/15/04	Thu 8/19/04
527	Broadway Ave. EB Bridge Deck Overlay	110 days	Tue 11/16/04	Mon 1/17/05	Mon 9/5/05
528	Broadway Ave. WB Bridge Deck Overlay	110 days	Tue 11/15/05	Mon 1/16/06	Wed 9/6/06
529	**UPRR Bridge (PPCB)**	**200 days**	**NA**	**Thu 1/15/04**	**Wed 10/20/04**
530	Bridge Widening over UPRR	138 days	Tue 10/21/03	Thu 1/15/04	Wed 10/20/04
531	UPRR EB Bridge Deck Overlay	131 days	Tue 11/16/04	Mon 1/17/05	Mon 10/10/05
532	UPRR WB Bridge Deck Overlay	125 days	Tue 11/15/05	Mon 1/16/06	Mon 10/2/06
534	**Main Line Reconstruction**	**382 days**	**NA**	**Mon 3/22/04**	**Tue 9/6/05**
535	Widen & Resurface (EBL & WBL) (Sec. 1-4 & 8-10)	142 days	Tue 10/21/03	Mon 3/22/04	Tue 3/22/05
536	W to E I-35/80 Interchange Reconstruction (Sec. 5, 6, 7 EBL)	100 days	Tue 7/20/04	Wed 3/23/05	Tue 9/6/05
537	W to E I-35/80 Interchange Reconstruction (Sec. 5, 6, 7 WBL)	100 days	Tue 7/19/05	Wed 3/23/05	Tue 9/6/05

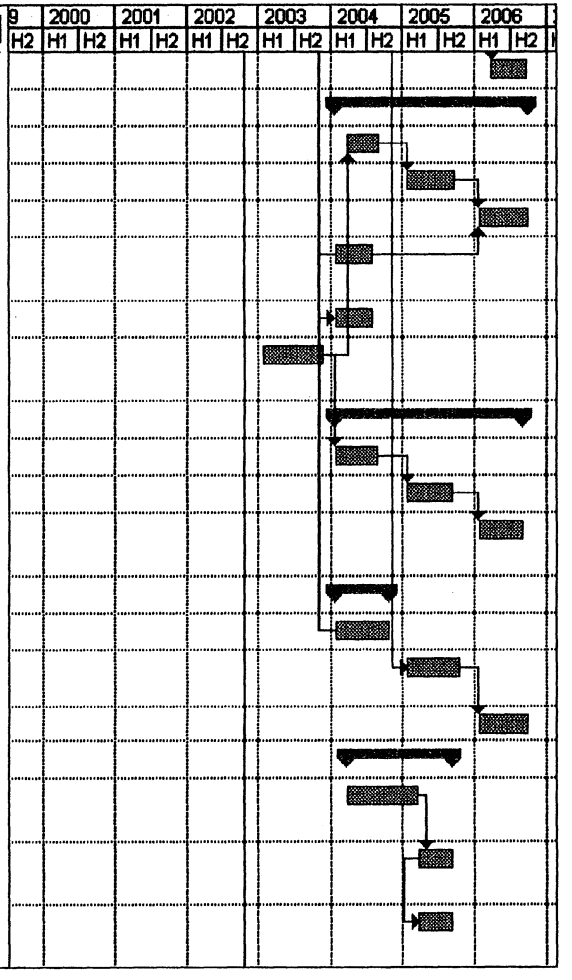


Figure 18: Schedule for I-235 Reconstruction (continued)

APPENDIX B:

MINNESOTA DOT UTILITY COORDINATION FLOWCHARTS

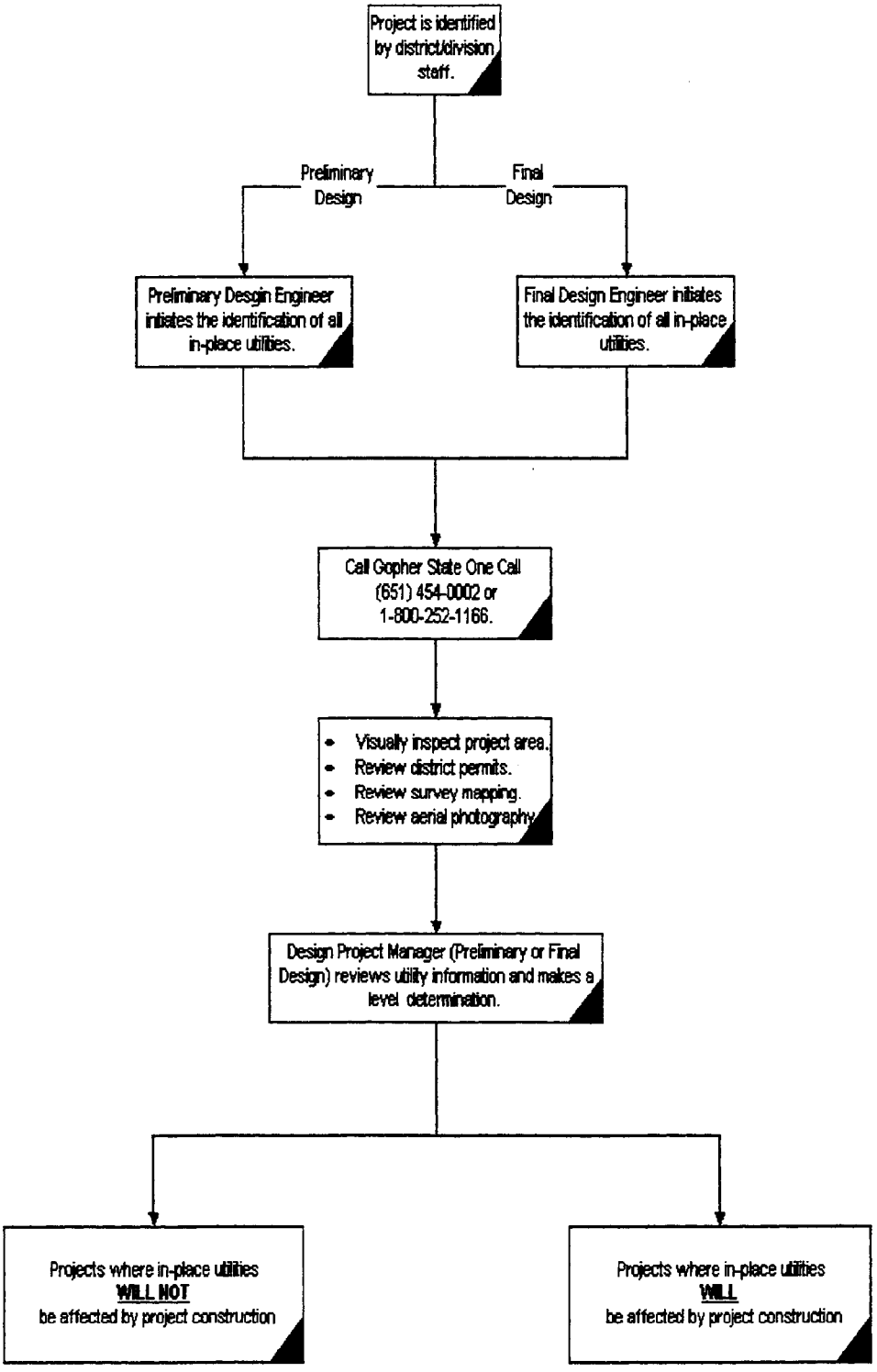


Figure 19: Identification Flowchart [9]

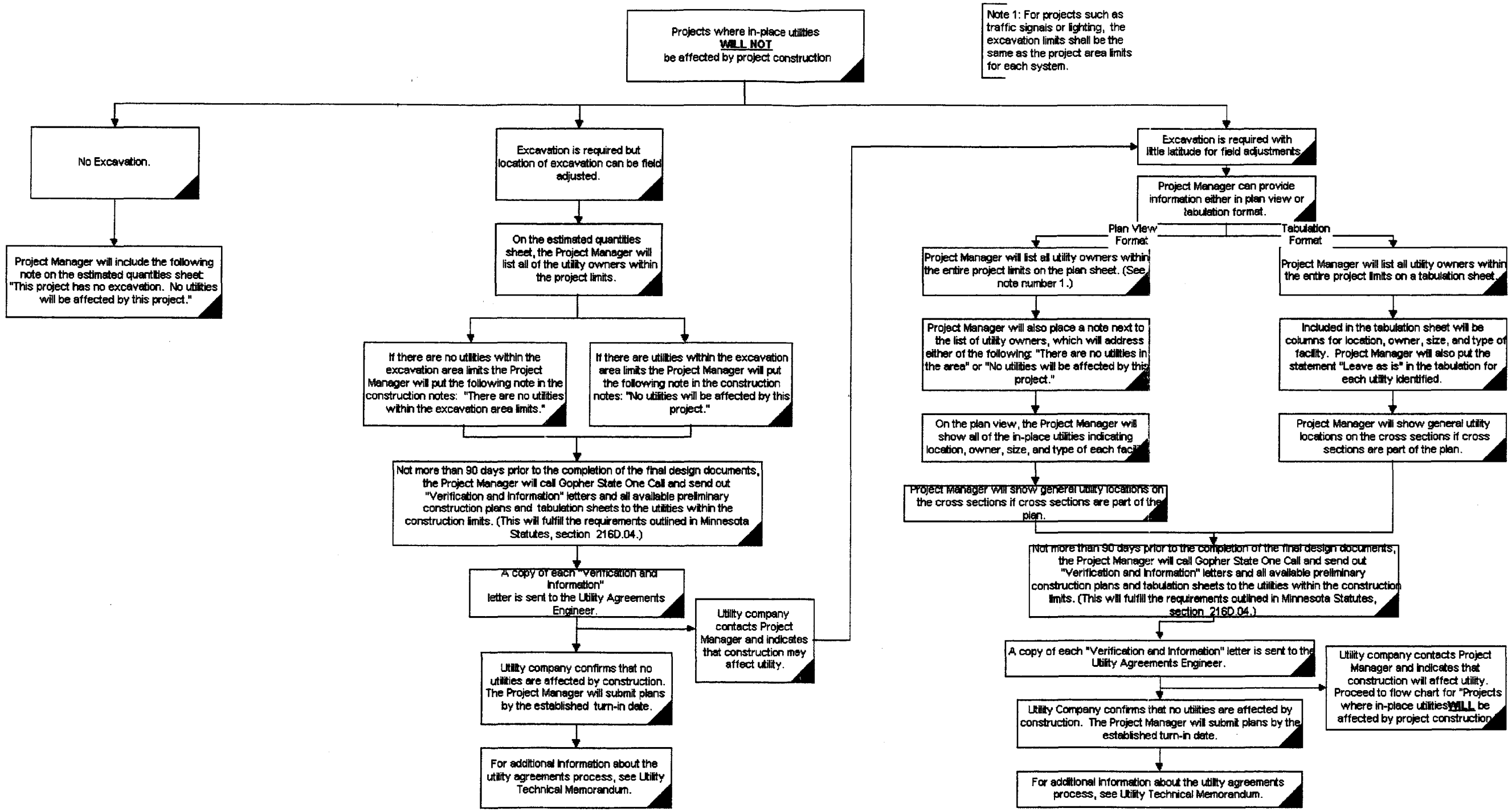


Figure 20: Verification and Coordination Flowchart Where Excavation **Does Not** Affect Utilities [8]

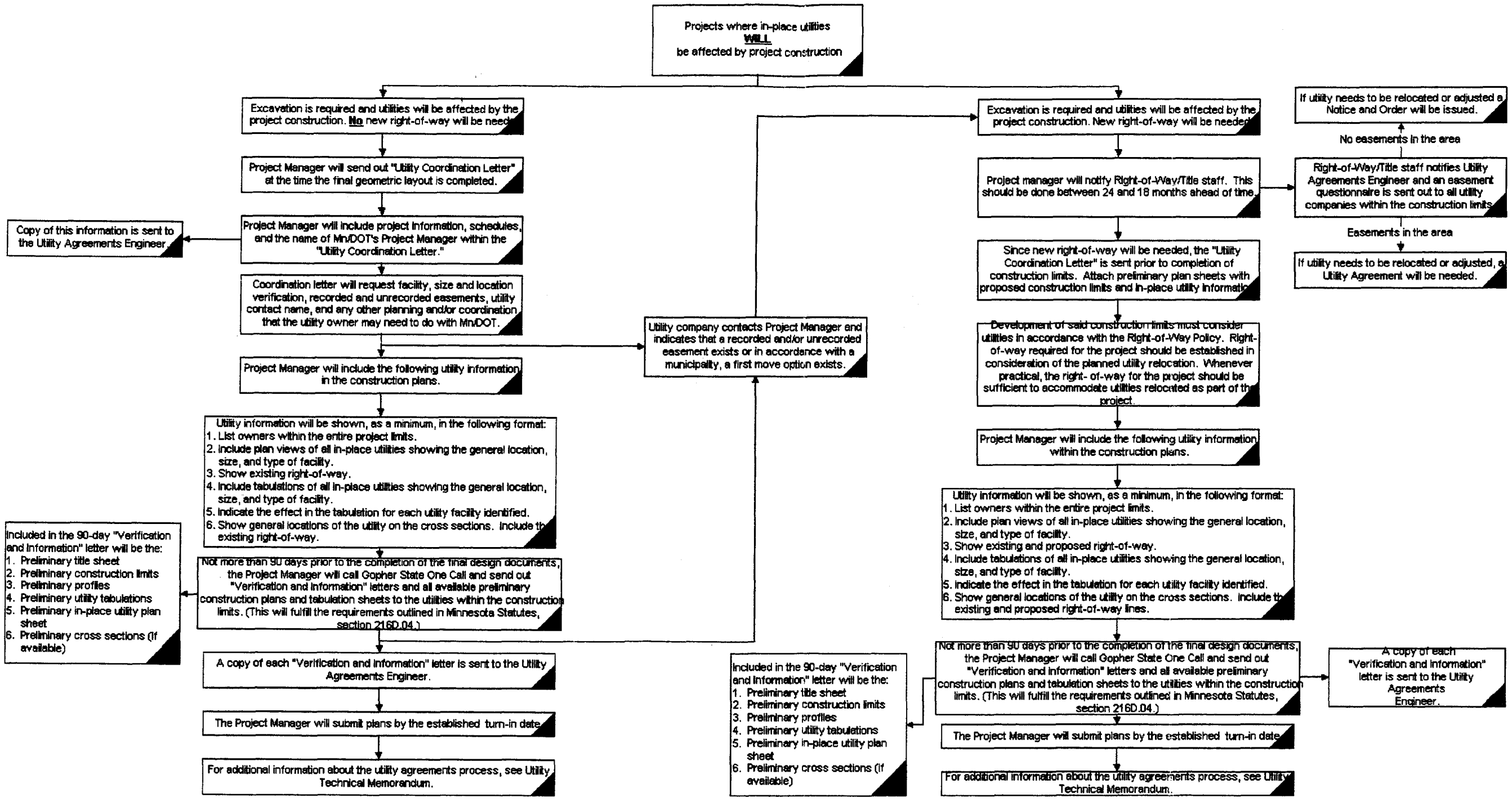


Figure 21: Verification and Coordination Flowchart Where Excavation **Does** Affect Utilities [7]

APPENDIX C:

MINNESOTA DOT FORM LETTERS

FOR UTILITY COORDINATION

Note to Designers: Italicized phrases or blanks indicate information needs to be typed in. Then DELETE italicized phrases and blanks, INCLUDING THIS PROMPT.

UTILITY COORDINATION LETTER
The Project Manager sends this letter with one of the following, depending on the project scope: Final geometric layout with utilities, or preliminary plans, which show the construction limits and the utility information. For additional information concerning when to send out this letter, see Technical Memorandum 01-02-TS-02, page 7, coordination.

(Date)

(Utility Company's name and address)

In reply, refer to: *(Project Description)*
(S.P. (T.H._____))
(Location)

Dear: *(name)*

(Designer: Use the following paragraph when NEW right-of-way is needed on a project. DELETE this paragraph if it is not needed, and delete this prompt.)

At this time, the Minnesota Department of Transportation (Mn/DOT) is in the process of preparing the construction plans for the above-referenced project. It has been determined by Mn/DOT that additional right-of-way will be needed for the highway project and that your utility facility will be required to be relocated/adjusted and/or left as is. Enclosed is a copy of all up-to-date project information along with a copy of preliminary construction plans and right-of-way information. This project is scheduled for letting on _____, *(date)* with construction beginning _____ *(date)* and ending _____. *(date)*

(Designer: Use the following paragraph when NO new right-of-way is needed on a project. DELETE this paragraph if it is not needed, and delete this prompt.)

At this time, the Minnesota Department of Transportation (Mn/DOT) is in the process of completing the final geometric layout for the above-referenced project. It has been determined by Mn/DOT that your utility facility will need to be relocated/adjusted and/or left as is. Enclosed is a copy of the layout along with all of the utility information gathered by Mn/DOT to date. This project is scheduled for letting on _____, *(date)* with construction beginning _____ *(date)* and ending _____. *(date)*

The enclosed information is also being sent to other utility owners within the construction limits. These other utility owners include but are not limited to:

(List all of the utility owners here. DELETE this prompt.)

To respond to this letter, please follow the numbered instructions that accompany the questions below and send your responses to _____ *(Project Manager)* unless indicated otherwise in the questions.

1. Please review the enclosed information and indicate whether the plans accurately represent your existing facilities.

Figure 22: Minnesota DOT Form Letter for Utility Coordination [24]

2. Please answer the following questions: ***(Designer: Choose which questions you wish to include, or revise them, or write your own, then DELETE this prompt.)***

   a. Are all of your facilities located on these preliminary plans / final geometric layout / tabulations shown correctly? If not, please provide correct information on updated documents with your response to this letter.
   b. Do you have any abandoned facilities? If yes, please provide maps.
   c. Do you plan to place any additional facilities within the construction limits before Mn/DOT's letting date? Please explain.
   d. Do you have any special requirements when relocating or removing your facilities? Please describe.
   e. Will any of your facilities be abandoned in-place or removed? Please explain.
   f. Do you know of any utility companies within this proposed construction area that are not listed above? If yes, please provide names of utility companies.
   g. Do you have any co-location agreements with other utility companies? If yes, please submit maps and detailed information.
   h. Do you have any unrecorded easements (in the outlined area)/(or within the construction limits)? If yes, and if you have not done so before, please send a copy to:

      Minnesota Department of Transportation
      Utility Agreements Engineer
      395 John Ireland Blvd., MS 678
      St. Paul, MN 55155-1899

   i. Are any of your affected facilities located on fee-owned property? If so, please advise us immediately and send a copy to the above address.

3. Please begin to plan your utility relocation activities, as necessary. You will receive a Notice and Order with the final plan prior to the above project being advertised for bid. Any relocation work that is eligible for reimbursement may not commence prior to an agreement execution.

If you have any questions or comments regarding the plans for the above-referenced project, please contact me at _____. *(District/Division telephone number)* In order to proceed with the design of this project, we need this information provided by _____. *(date)*

Sincerely,

District Pre-Design/Design Engineer

Enclosure:

cc:
(Consultant - if involved)
Utility Agreements Engineer, MS 678
File

Information supplied by _____ *(utility company)*

_____
(Name) (Phone Number)

The following person is the field representative assigned to this project:

_____
(Name) (Phone Number)

Figure 22: Minnesota DOT Form Letter for Utility Coordination (continued) [24]

Note to Designers: Italicized phrases or blanks indicate information needs to be typed in. Then DELETE italicized phrases and blanks, INCLUDING THIS PROMPT.

UTILITY IDENTIFICATION LETTER
The Project Manager sends this letter, with a copy of the title request map, after a utility has failed to respond to the following two calls:
- the design locate request initiated by Gopher State One Call
- the phone request initiated by the Project Manager

(Date)

(Contractor's Name and Address)

In reply, refer to: *(Project Description)*
(S.P. (T.H._____))
(Location)

Dear: *(name)*

On _____, *(Designer: insert date when you contacted Gopher One Design Call)* your offices were contacted by Gopher State One Call, ticket number # _____, *(insert ticket number)* about the above-referenced Minnesota Department of Transportation (Mn/DOT) construction project. As of this writing, Mn/DOT has not received any of the information requested from your office regarding your facilities. This letter outlines instructions regarding location and design work to help you comply with our request. For your reference, a copy of the general layout of the proposed construction area is enclosed.

Location Work
Mn/DOT requests that you follow the instructions below regarding location work and provide us with any necessary information for all your existing facilities within the proposed construction area, in accordance with Minnesota Statutes 216D.04, Subd. 1a.:

(Designer: Listed below are sample questions that you may want answered regarding your design. Choose which questions you wish to include, or revise them, or write your own, and then DELETE this prompt.)

1. Show the approximate location of all your facilities. You may provide maps or diagrams of the facilities, or you may locate a utility facility within the proposed construction area. Please call me at _____ *(District/Division Project Manager's phone number)* if you will be providing actual field location information.

2. Indicate the size and type of each facility (for example, "6-inch cast iron pipe").

3. Indicate voltage of all electrical power lines.

Mn/DOT requests that you complete this location work by _____. *(Designer: Allow for a 7-day period.)* Failure to perform the work by the time indicated would place your company in violation of

Figure 23: Minnesota DOT Form Letter for Utility Identification [25]

Minnesota Statutes 216D.04, Subd. 1a, "Plans for Excavation." In such a situation, Mn/DOT would contact the Commissioner of Pipeline Safety regarding violation proceedings, as identified within Minnesota Statutes 216D.

Design Work
In addition to the questions on location work outlined above, Mn/DOT requests information that could assist in the design process, as follows:

(Designer: Listed below are sample questions that you may want answered regarding your design. Choose which questions you wish to include, or revise them, or write your own, and then DELETE this prompt.)

1. Will you have any abandoned facilities within the area? If yes, please indicate accordingly.
2. Do you plan to place any additional facilities within the construction limits before Mn/DOT's letting date? If yes, please explain.
3. Will you have any special requirements when relocating or removing your facilities? If yes, please give details.

If you have any questions or comments regarding the plans for the above-referenced project, please contact me at _____*(District/Division telephone number)*.

Sincerely,

District Pre-Design/Design Engineer

Enclosure:

cc:
(Consultant - if involved)
Utility Agreements Engineer, MS 678
File

Information supplied by _____ *(utility company)*

_____
(Name) (Phone Number)

The following person is the field representative assigned to this project:

_____
(Name) (Phone Number)

Figure 23: Minnesota DOT Form Letter for Utility Identification (continued) [25]

Note to Designers: Italicized phrases or blanks indicate information needs to be typed in. Then DELETE italicized phrases and blanks, INCLUDING THIS PROMPT.

UTILITY VERIFICATION AND INFORMATION LETTER
The Project Manager sends this out with the preliminary plan, which contains the title sheet, construction sheets, utility tabs and in place utility plan sheets not more than 90 days prior to submission of final construction plans to Central Office.

(Date)

(Contractor's Name and Address)

In reply, refer to: *(Project Description)*
(S.P. (T.H. _____))
(Location)

Dear: *(name)*

The construction project referenced above is scheduled to be let by the Minnesota Department of Transportation (Mn/DOT) on _____. *(date)*. Enclosed are copies of the construction plan sheets, which include the proposed right-of-way limits and all known utility information. Construction is scheduled to begin on _____ *(date)* and end on _____. *(date)*

The enclosed information is also being sent to other utility owners within the construction limits. These other utility owners include but are not limited to:

(Designer: list all the utility owners in the area. DELETE this prompt.)

To respond to this letter, please follow the numbered instructions that accompany the questions below and send your responses to _____ *(Project Manager)* unless indicated otherwise in the questions.

Please review the enclosed information *(preliminary plans, final geometric layout, tabulations, etc. Select all that apply)* and indicate whether they correctly represent your existing facilities. If not, please provide correct information on updated documents with your response to this letter.

(Designer: Insert any questions of your own here. Include the following 4 points and paragraph if excavation is required. DELETE this prompt.)

1. Do you plan to place any additional facilities within the construction limits before Mn/DOT's letting date? If yes, please explain.
2. Do you have any co-location agreements with other utility companies? If yes, please submit maps and detailed information with your response to this letter.
3. Do you have any unrecorded easements within the construction limits? If yes, and if you have not done so before, please send copies of the unrecorded easements to:
   Minnesota Department of Transportation
   Utility Agreements Engineer
   395 John Ireland Blvd., MS 678

Figure 24: Minnesota DOT Form Letter for Utility Verification and Information [27]

St. Paul, MN 55155-1899

4. Are any of your affected facilities located on fee-owned property? If so, please advise us immediately and send a copy of the land rights to the Mn/DOT Utility Agreements Engineer at the above address.

Please begin to plan your utility relocation and/or adjustment activities, as necessary. You will receive a Notice and Order with the final plan prior to the advertising of this project for bid. The Notice and Order states that the utility company has 30 days to respond to Mn/DOT's Project Construction Engineer with a plan and schedule for any relocation and/or adjustment work. Any relocation work that is eligible for reimbursement may not commence prior to an agreement execution.

(Designer: If excavation is required, include the previous 4 questions and paragraph. DELETE this prompt.)

If you have any questions or comments regarding the plans for the above-referenced project, please contact me at _____. *(telephone no.)* In order to proceed with the design of this project, we need your response to this letter by _____. *(date)*

Thank you for your assistance.

Sincerely,

District Pre-Design/Design Engineer

Enclosure:
Plan Sheets
(list other documents enclosed)

cc:
(Resident Engineer)
(Consultant - if involved)
Utility Agreements Engineer, MS 678
File

Information supplied by _____ *(utility company)*

_____
(Name) (Phone Number)

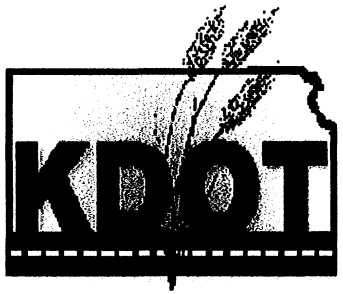
The following person is the field representative assigned to this project:

_____
(Name) (Phone Number)

Figure 24: Minnesota DOT Form Letter for Utility Verification and Information (continued) [27]

APPENDIX D:

KANSAS DOT ONLINE UTILITY COORDINATION FORMS



Survey Notice Form A

Please enter KDOT project # :

Please Enter Company Name:

1. Do you have facilities within survey limits? Yes ◉ No ○

2. If yes, please provide information you feel pertinent:

Figure 25: Kansas DOT Survey Notice Online Form [22]

Information on local representative able to provide survey crew facility information.

Name:

Address 1:

Address 2:

City:

State:

Zip Code:

Phone:

Email:

Information provided by:

Name*:

Address 1*:

Address 2:

City*:

State*:

Zip Code*:

Phone*:

Email*:

Figure 25: Kansas DOT Survey Notice Online Form (continued) [22]

Kansas Department of Transportation

Utility Questionnaire Form B

Please enter KDOT project #:(xxx-xxx x-xxxx-xx) :

Please enter Company Name :

1. Is utility relocation necessary to clear proposed construction? Yes ○ No ○
2. Utility is located on? Public Right of Way
3. Will you be submitting a plan and estimate of relocation for reimbursement consideration?
   Yes ○ No ○
   If yes, when?
4. If a consulting engineering firm will be preparing relocation plan and estimate, enter name of firm.
   Prior to a consulting engineer preparing relocation plan and estimate please forward a copy of proposed engineering agreement for review and approval by KDOT.
5. Will your firm contract the relocation work? Yes ○ No ○
6. If yes, by? Not Applicable
   If by continuing contract, provide copy of contract to this office at Kansas Department of Transportation, Utilities-Coordinating Section, Docking State Office Bldg, 915 SW Harrison Street, Room 815, Topeka, KS 66612-1568.
7. Estimate time interval from approval to proceed date to commencement of work date.
8. Estimate number of working days needed to complete relocation.
9. Company's Local Representative information:
   Name:
   Address 1:
   Address 2:
   City: , State: Zip Code:

Figure 26: Kansas DOT Utility Questionnaire Online Form [12]

Phone:

10. Comments:

Name*:

Address 1*:

Address 2:

City*:

State*:

Zip Code*:

Phone*:

Email*:

* - required fields

Submit Reset

Figure 26: Kansas DOT Utility Questionnaire Online Form (continued) [12]

Utility Status Form

Please enter KDOT project # (xxx-xxx x-xxxx-xx) :

Please enter Scheduled Letting Date (MM/DD/YYYY) :

Company Name	Agreement Number	Percent Complete	Estimated Completion Date	Actual Completion Date

Figure 27: Kansas DOT Utility Status of Work Online Form [26]

If you have additional information please provide it here:

Name*:
Address 1*:
Address 2:
City*:
State*:
Zip Code*:
Phone*:
Email*:

* - required fields

Submit Reset

Figure 27: Kansas DOT Utility Status of Work Online Form (continued) [26]

APPENIDX E:

EXAMPLE OF COMPLETED PERMIT APPLICATION

Iowa Department of Transportation
Maintenance Division Ames, IA 50010

Form 810025 3-00

Application and Agreement for use of Highway Right of Way for Utilities Accommodation

Permit Number 77U-2002-27
Highway I-235
County Polk
Project IM-235-2(475)8-13-77
Completion Date 4/9/03

APPLICANT:

Des Moines Water Works (515) 283-8725
Name of Individual or Company (Please print or type) Telephone No.

2201 Valley Drive Des Moines, IA 50321
Address

INSTALLATION TO BE ACCOMMODATED:

Approval is hereby requested to enter within the state highway right of way for the accommodation of a utility installation as detailed on the attachments and further described as follows:

The installation shall consist of approximately 1171 feet of 24-inch HDPE and 130 feet of 20-inch DIP water main installed in 1200 feet of HDPE or steel casing. The casing will be installed by horizontal directional drilling. Transverse crossing 514+79.9(m)

and shall be located as shown on the detailed plan attached hereto. *(See current Iowa Department of Transportation Utility Accommodation Policy for submittal of detailed plan requirements.)*

WORK SITE LOCATION:

The proposed work as described above is located in Section 5, Twp. 78, Range 24 on Highway No. I-235, generally located at ~~xxxxx~~ Cottage Grove (direction) from _____ (city, county line or other land line).

Work proposed is more specifically located ~~xxxxxxxxxx~~ at ~~xMilepostxx~~ 514+79.9 (m) (Highway Station) to _____ (Milepost#) or _____ (Highway Station) on the both sides of highway.

I have read this Agreement, understand its provisions, and agree to abide by it and the utility accommodation policy of the Iowa Department of Transportation.

Applicant

Kyle Danley By [signature] Engineer
Name of Agent (print or type) Agent/Owner Signature Title

Des Moines Water Works Date March 3 2002
Name of Owner (print or type) Month Day Year

CITY ACTION:

(If proposed work is within an incorporate city, city action is required)

"The undersigned city joins in the grants embodied in the above permit executed by the Iowa Department of Transportation on condition that all of the covenants and undertakings therein running to the Iowa Department of Transportation shall inure to the benefit of the undersigned city and recommends action on said permit application as noted below by the delegated city official".

☑ Recommend Approval ☐ Do Not Recommend Approval

Motasem Alturk Senior Traffic Eng. 3-26-02
Signature Title Date

By Motasem Al-Turk Authorized Official for the City of Des Moines
Type or Print Name

COUNTY ACTION:

(If proposed work crosses county right of way, county action is required)

"The undersigned county joins in the grants embodied in the above permit executed by the Iowa Department of Transportation on condition that all of the covenants and undertakings therein running to the Iowa Department of Transportation shall inure to the benefit of the undersigned county and recommends action on said permit application as noted below by the delegated county official".

☐ Recommend Approval ☐ Do Not Recommend Approval

By _____ _____ _____
Signature Title Date

_____ Authorized Official for the County of _____
Type or Print Name

Special Requirements

In addition to the stipulations stated on Page 2 of this form the following special Requirements shall apply to this permit:

Work needs to be coordinated with Des Moines Construction Office, 237-3312.

APPLICANT RESPONSIBLE FOR FILLING THIS SECTION OF APPLICATION. ASSISTANCE FROM DEPARTMENT AVAILABLE UPON REQUEST.

PLEASE CONTINUE ON PAGE 2

UTILITIES

Figure 28: Example of Completed Permit Application

APPENDIX F:

I-235 PROJECT SPREADSHEET

SORTED BY LETTING DATE

Table 4: I-235 Projects Sorted By Letting Date

Notes:
1. Projects are color-grouped by Letting Date.
2. Current Project # : Project No. after project is tied.
3. Original Project # : Project No. before project is tied.

**** If one project has both Current Project # and Original Project #, this project is tied w/ other project(s) ****

Current Project # ②	Original Project # ③	Task	Letting Date	Remarks
2002 Lettings				
(351)11		Noise Wall - Easton to Guthrie (W side)	10/29/02	
(359)13		Euclid Ave. Interchange Resurfacing, Bridge Repl'mt., Euclid Ave. Reconstruction	10/29/02	
(465)8		Storm Sewer/Intakes - Birds Run Phase 1 From Des Moines River to 8th & Keo	10/29/02	
(491)		Traffic Signals On Euclid Ave. W & E Ramp Terminals	10/29/02	
(492)		Demolition at Various Locations Parcel No. 93, 105, 110C, 223, 705 221	10/29/02	
(274)2		35th St. Bridge Repl'mt	01/14/03	
(294)5		Polk Blvd Bridge Repl'mt, Incl. Part of ret. Wall	01/14/03	
(307)7		19th St. Bridge Repl'mt, incl. 2 ret. Walls & MLK Bridge removal	01/14/03	
(373)2		Culvert Extension - 35th St. (W DsM)	01/14/03	
(425)2		Noise Wall (35th to 28th, S. side)	01/14/03	
(430)2		Reconstruction 35th St. Interchange	01/14/03	
(449)8	(449)8	19th St. G&P	01/14/03	
(469)2		Bridge Fence - In WDsM E to E 12th St in DsM (8 Bridges)	09/27/02	
(329)9		Ramps & CD Roads between E 6th & E 15th St., incl. Sideroads (E 6th, Penn., E 12 th)	02/18/03	

(329)9	(328)9	Penn Ave Bridge Repl'mt (Steel), incl. E 6th Bridge removal	02/18/03	
(329)9	(331)9	E12th St Bridge Repl'mt (Steel), incl. Soil nail wall at bridge	02/18/03	
(329)9	(463)11	Sanitary Sewer - Along Lyon St. To E. 13th St.(S. Side)	02/18/03	
(341)11		WB Paving - Univ. to Guthrie	03/18/03	
(467)		ST S/Intakes – Deans Lake outfall. Along UPRR to Deans Lake	06/17/03	
(470)		Bridge Fence (63rd. St., 56th St., 31st. St, 9th St., 7th. St., 6th. Ave., E14th St.)	07/15/03	
(466)		ST S/Intakes – Birds Run Phase II (from DsM River to 8th & Keo)	08/19/03	
(286)4		63rd St. Interchange reconstruction	09/16/03	
(287)4		63rd St Bridge Repl'mt	09/16/03	
(332)9		Ramps G&P, E 13th to Univ. & E 14th/ E 15th sideroads	09/16/03	
(423)4		Culvert Extension (0.25 km W of 56th)	09/16/03	
(290)6		Pedestrian Overpass at 44th St.	10/21/03	
(291)6		Pedestrian Overpass E of 42nd St.	10/21/03	
(295)6		42nd Interchange reconstruction	10/21/03	
(296)6		42nd Bridge Repl'mt	10/21/03	
(297)6		35th St WB ML Bridge Widening (temporary)	10/21/03	
(315)8		7th St. Bridge (Steel) Repl'mt., incl. Approach & 2 ret. Walls	10/21/03	
(316)8		6th Ave. Bridge (Steel) Repl'mt.(incl. Bridge removal)	10/21/03	
(318)8		5th St. Bridge (Steel) Repl'mt., incl. Approach	10/21/03	
(333)9		E14th St Bridge (Steel) Repl'mt	10/21/03	
(338)		University Ave WB Bridge Replacement	10/21/03	
(346)14		WB Bridge over UPRR, Repl'mt.	10/21/03	
(352)12		Guthrie Ave. Median Bridge	10/21/03	
(356)12		Hull Ave. Median Bridge	10/21/03	
(360)14		Broadway Ave. Median Bridge Widening	10/21/03	
(362)14		Bridge Widening over UPRR	10/21/03	
(364)0		Noise Wall from 56th St. to 42th St. (S. side)	10/21/03	
(364)0		Noise Wall (63rd Ramp A)	10/21/03	
(364)0		Noise Wall (42th St. Ramp A)	10/21/03	
(364)0		Noise Wall (31st to 28th, both side)	10/21/03	

(372)11		WB ML G&P thru Univ. Int (incl Bridge over Univ & UPRR, different contractors)	10/21/03	
(379)11		EB Exit ramp to EB Univ. - G&P	10/21/03	
(404)11		Noise Wall from E 16th to Walker (N side)	10/21/03	
(405)12		Noise Wall - S. of Hull Ave. (E. side, Morton to Sheridan)	10/21/03	
(405)12		Noise Wall - S. of Hull Ave. (W. side)	10/21/03	
(407)2		Center St. Noise Wall (N. Side)	10/21/03	
(411)4		6" Resurfacing of 73rd St. Interchange - both sides	10/21/03	
(441)		ML Widen and Resurfacing (8") (EB/WB) [RUBBLIZING]	10/21/03	
(452)8		Ramps & CD Roads between 9th St. and DsM R.	10/21/03	
(392)9		E 15th St Bridge Widening	12/12/03	

(277)3		22nd Median Bridge	01/27/04	
(279)3		17th St Median Bridge	01/27/04	
(376)2		Culvert Extension (28th St. to 22nd St.)	01/27/04	
(377)3		Culvert Extension (E of 17th)	01/27/04	
(451)7		28th St. Sideroad Reconstruction	02/17/04	
(268)		EB ML (incl. Median Fill G&P) [RECONSTRUCTION]	07/20/04	
(479)		Reconstruction University Ave.	07/20/04	
(323)9		DsM River EB Bridge, Superstructure Repl'mt.	09/21/04	
(488)		Keo Way Interchange & CD Roads (S. side)	09/21/04	
(282)4		73rd St EB ML Bridge Widen / Redeck	10/19/04	
(284)4		Walnut Creek EB Bridge Widen / Redeck	10/19/04	
(293)5		56th St Bridge Repl'mt	10/19/04	
(299)6		31st St Interchange reconstruction	10/19/04	
(300)6		31st St. Bridge Repl'mt	10/19/04	
(302)7		28th St EB ML Bridge Repl'mt	10/19/04	
(309)8		Keo Way EB ML Bridge Repl'mt.	10/19/04	
(313)8		9th St. Bridge (Steel) Repl'mt	10/19/04	
(334)9		E 15th St Bridge EB Repl'mt.	10/19/04	
(386)8		EB Exit bridge to 7th, 6th, 5th St, Repl'mt.	10/19/04	
(393)3		22nd St EB ML Bridge Repl'mt.	10/19/04	

(410)3		17th St EB ML Bridge Repl'mt. (WDsM)	10/19/04	
(412)6		35th St EB ML Bridge Repl'mt	10/19/04	
(448)		17th St. Sideroad reconstruction	10/19/04	
(453)5		56th St Interchange reconstruction	10/19/04	
(454)5		Culvert Extension (56th St.)	10/19/04	
(335)11		EB Entr. Bridge over EB Exit to Univ.	11/16/04	
(337)11		2 - WB Entr Ramp Bridges from Univ., Repl'mt.(Univ. Ave Area)	11/16/04	
(339)11		Univ. Ave EB Bridge Repl'mt.	11/16/04	
(345)14		EB Bridge over UPRR, Repl'mt.	11/16/04	
(348)11		E 21 St. EB Bridge Repl'mt. - incl. Ramp bridge	11/16/04	
(350)11		Easton EB Bridge (Steel) - New	11/16/04	
(353)12		Guthrie Ave.EB Bridge Repl'mt.	11/16/04	
(357)12		Hull Ave EB Bridge Repl'mt.	11/16/04	
(361)14		Broadway Ave. EB Bridge Deck Overlay	11/16/04	
(363)14		UPRR EB Bridge Deck Overlay	11/16/04	
(381)11		Easton Blvd. & ramps G&P	11/16/04	
(409)4		Cummins Pkwy EB Bridge Repl'mt	11/16/04	

2005 Letting				
(342)11		Ramp G&P, WB exit to (& entr. From) WB Univ., EB exit to Univ.	01/25/05	
(378)11		WB on Ramp from WB Univ- G&P	01/25/05	
(389)11		Easton to Guthrie Noise Wall (E side)	01/25/05	
(269)		WB ML (incl. Median Fill G&P) [RECONSTRUCTION]	07/19/05	
(276)3		Reconstruction 22nd St. Interchange (22nd St. and ramps)	11/15/05	
(278)3		22nd St WB ML Bridge Repl'mt.	11/15/05	
(280)3		17th St WB ML Bridge Repl'mt. (WDsM)	11/15/05	
(283)4		73ed St WB ML Bridge Widen / Redeck	11/15/05	
(285)4		Walnut Creek WB Bridge Widen / Redeck	11/15/05	
(298)6		35th St WB ML Bridge Repl'mt	11/15/05	
(303)7		28th St WB ML Bridge Repl'mt	11/15/05	
(319)8		EB Entrance between 5th Ave. & 4th St. Bridge Repl'mt.	11/15/05	

(368)9		E 15th St Bridge WB Repl'mt.	11/15/05	
(403)3		Culvert Extension at 22nd St.	11/15/05	
(414)12		Hull Ave. WB Bridge Repl'mt.	11/15/05	
(415)14		Broadway Ave. WB Bridge Deck Overlay	11/15/05	
(416)14		UPRR WB Bridge Deck Overlay	11/15/05	
(487)		35th St. sideroad reconstruction	11/15/05	
(289)4		Cummins Pkwy WB Bridge Repl'mt	12/20/05	
(310)8		Keo Way WB ML Bridge Repl'mt.	12/20/05	
(312)8		WB CD Bridge over Keo Way, Repl'mt.	12/20/05	
(325)9		DsM River WB Bridge, Superstructure Repl'mt.	12/20/05	
(413)12		Guthrie Ave WB Bridge Repl'mt.	12/20/05	
(455)8		Keo Way Interchange & CD Roads (N. side)	12/20/05	
(489)		G&P W/E River Drive	12/20/05	

(304)7		Cottage Grove Bridge Relocation, incl. Bridge removal	12/14/01	Previously Let
(306)7		MLK Blvd bridge repl'mt	12/14/01	Previously Let

2002 Lettings				
(272)1	(272)1	42nd St. Bridge (PPCB) Repl'mt., Incl. Approach	01/15/02	Previously Let
(272)1	(275)2	28th St. Bridge (PPCB) Repl'mt., incl. Appro.	01/15/02	Previously Let
(272)1	(375)2	Culvert Extension (28th St.)	01/15/02	Previously Let
(330)-A	(326)9	E6th St Bridge Repl'mt (Steel)	02/19/02	Previously Let
(330)-A	(330)9	E9th St bridge Repl'mt (Steel)	02/19/02	Previously Let
(305)7	(305)7	Cottage Grove - MLK Blvd G&P	03/26/02	Previously Let
(305)7	(475)8	Water Work @ Cottage Grove	03/26/02	Previously Let
(458)		Storm Sewer @ Maple	03/26/02	Previously Let
(468)		Bridge Fence - E 6th	03/26/02	Previously Let
(474)		Water Work @ Washington Ave.	03/26/02	Previously Let
(476)		Demo. -- Parcel 470	03/26/02	Previously Let
(478)		Demo. -- Parcel 003-007	03/26/02	Previously Let

(340)11	(340)11	WB Grading - Univ. to Guthrie, incl. Ret. Walls (E 9th to E 14th)	04/30/02	Previously Let
(340)11	(344)11	WB Exit at Univ. Bridge (over RR) Repl'mt.	04/30/02	Previously Let
(340)11	(347)11	E 21 St. WB Bridge (PPCB)Repl'mt.	04/30/02	Previously Let
(340)11	(349)11	Easton WB Bridge (Steel) - New, incl. Pedestrian Overpass at Washington, Removal	04/30/02	Previously Let
(340)11	(406)12	Traffic Signals - at Guthrie Ave. (Ramp Terminals)	04/30/02	Previously Let
(340)11	(472)11	Sanitary Sewer - Near Easton Blvd. & E 21 St.	04/30/02	Previously Let
(456)12		Sanitary Sewer - On Thompson/Tichenor St.	06/04/02	Previously Let
(462)10		Sanitary Sewer - At East High School & E. 14th St.	06/04/02	Previously Let
(482)		Demo. - 1050 16th, 1030 17th, 1701 WALKER, Des Moines. Specific locs are shown elsewhere in the contract documents	06/04/02	Previously Let
(460)8		Sanitary Sewer - Along School St From Keo To 18th St. (S. Side)	07/16/02	Previously Let
(461)8		Sanitary Sewer - Along Day St. From Keo To MLK(N. Side)	07/16/02	Previously Let
(484)8		Demolition - 1055 MLK & 1034 17th St, DsM.	07/16/02	Previously Let
(473)7		Traffic Signals Lighting - On MLK Blvd. & Cottage Grove	08/20/02	Previously Let
(477)8	(320)8	3rd St. Bridge Repl'mt	08/20/02	Previously Let
(477)8	(321)9	2nd Ave. Bridge Repl'mt., incl. Approach, School St. (3rd to DsM river)	08/20/02	Previously Let
(477)8	(322)9	Bridge widening (WB/EB) Ramp & ML over DsM River	08/20/02	Previously Let
(477)8	(477)8	Pavement(Replace) - At 2nd Ave./3rd St. & Ramps	08/20/02	Previously Let
(477)8	(485)	Roadway Item @ 2nd Ave/3rd St. & ramps	08/20/02	Previously Let
(486)		Demolition - in Des Moines at various locations. Parcel no. 60, 100b, 100c, 104, 111 & 406	08/20/02	Previously Let
(327)9		Pedestrian Overpass at Botanical Cntr	09/27/02	Previously Let
(490)		Demolition at River Hills APTS., 5th St & Easton, DsM.	09/27/02	Previously Let

APPENDIX G:

I-235 PROJECT SPREADSHEET SORTED BY PROJECT PARENTHESIS NUMBER

Table 5: Projects Sorted by Parenthesis Number

Notes:
1. Projects are arranged by parenthesis number.
2. **Current Project #** : Project No. after project is tied.
3. **Original Project #** : Project No. before project is tied.
   *** ***If one project has both Current Project # and Original Project #, this project is tied w/ other project(s)*** ***

Current Project # ②	Original Project # ③	Task	Letting Date	Remarks
(268)		EB ML (incl. Median Fill G&P) {RECONSTRUCTION]	07/20/04	
(269)		WB ML (incl. Median Fill G&P) [RECONSTRUCTION]	07/19/05	
(272)1	(272)1	42nd St. Bridge (PPCB) Repl'mt., Incl. Approach	01/15/02	Previously Let
(272)1	(275)2	28th St. Bridge (PPCB) Repl'mt., incl. Appro.	01/15/02	Previously Let
(274)2		35th St. Bridge Repl'mt	01/14/03	
(276)3		Reconstruction 22nd St. Interchange (22nd St. and ramps)	11/15/05	
(277)3		22nd Median Bridge	01/27/04	
(278)3		22nd St WB ML Bridge Repl'mt.	11/15/05	
(279)3		17th St Median Bridge	01/27/04	
(280)3		17th St WB ML Bridge Repl'mt. (WDsM)	11/15/05	
(282)4		73rd St EB ML Bridge Widen / Redeck	10/19/04	
(283)4		73ed St WB ML Bridge Widen / Redeck	11/15/05	
(284)4		Walnut Creek EB Bridge Widen / Redeck	10/19/04	
(285)4		Walnut Creek WB Bridge Widen / Redeck	11/15/05	
(286)4		63rd St. Interchange reconstruction	09/16/03	
(287)4		63rd St Bridge Repl'mt	09/16/03	
(289)4		Cummins Pkwy WB Bridge Repl'mt	12/20/05	
(290)6		Pedestrian Overpass at 44th St.	10/21/03	
(291)6		Pedestrian Overpass E of 42nd St.	10/21/03	
(293)5		56th St Bridge Repl'mt	10/19/04	

(294)5		Polk Blvd Bridge Repl'mt, Incl. Part of ret. Wall	01/14/03	
(295)6		42nd Interchange reconstruction	10/21/03	
(296)6		42nd Bridge Repl'mt	10/21/03	
(297)6		35th St WB ML Bridge Widening (temporary)	10/21/03	
(298)6		35th St WB ML Bridge Repl'mt	11/15/05	
(299)6		31st St Interchange reconstruction	10/19/04	
(300)6		31st St. Bridge Repl'mt	10/19/04	
(302)7		28th St EB ML Bridge Repl'mt	10/19/04	
(303)7		28th St WB ML Bridge Repl'mt	11/15/05	
(304)7		Cottage Grove Bridge Relocation, incl. Bridge removal	12/14/01	Previously Let
(305)7	(305)7	Cottage Grove - MLK Blvd G&P	03/26/02	Previously Let
(305)7	(475)8	Water Work @ Cottage Grove	03/26/02	Previously Let
(306)7		MLK Blvd bridge repl'mt	12/14/01	Previously Let
(307)7		19th St. Bridge Repl'mt, incl. 2 ret. Walls & MLK Bridge removal	01/14/03	
(309)8		Keo Way EB ML Bridge Repl'mt.	10/19/04	
(310)8		Keo Way WB ML Bridge Repl'mt.	12/20/05	
(312)8		WB CD Bridge over Keo Way, Repl'mt.	12/20/05	
(313)8		9th St. Bridge (Steel) Repl'mt	10/19/04	
(315)8		7th St. Bridge (Steel) Repl'mt., incl. Approach & 2 ret. Walls	10/21/03	
(316)8		6th Ave. Bridge (Steel) Repl'mt.(incl. Bridge removal)	10/21/03	
(318)8		5th St. Bridge (Steel) Repl'mt., incl. Approach	10/21/03	
(319)8		EB Entrance between 5th Ave. & 4th St. Bridge Repl'mt.	11/15/05	
(323)9		DsM River EB Bridge, Superstructure Repl'mt.	09/21/04	
(325)9		DsM River WB Bridge, Superstructure Repl'mt.	12/20/05	
(327)9		Pedestrian Overpass at Botanical Cntr	09/27/02	Previously Let
(329)9	(329)9	Ramps & CD Roads between E 6th & E 15th St., incl. Sideroads (E 6th, Penn., E 12 th)	02/18/03	
(329)9	(328)9	Penn Ave Bridge Repl'mt (Steel), incl. E 6th Bridge removal	02/18/03	
(329)9	(331)9	E12th St Bridge Repl'mt (Steel), incl. Soil nail wall at bridge	02/18/03	

(329)	(463)11	Sanitary Sewer - Along Lyon St. To E. 13th St.(S. Side)	02/18/03	
(330)	(326)9	E6th St Bridge Repl'mt (Steel)	02/19/02	Previously Let
(330)	(330)9	E9th St bridge Repl'mt (Steel)	02/19/02	Previously Let
(332)9		Ramps G&P, E 13th to Univ. & E 14th/ E 15th sideroads	09/16/03	
(333)9		E14th St Bridge (Steel) Repl'mt	10/21/03	
(334)9		E 15th St Bridge EB Repl'mt.	10/19/04	
(335)11		EB Entr. Bridge over EB Exit to Univ.	11/30/04	
(337)11		2 - WB Entr Ramp Bridges from Univ., Repl'mt.(Univ. Ave Area)	11/16/04	
(338)		University Ave WB Bridge Replacement	10/21/03	
(339)11		Univ. Ave EB Bridge Repl'mt.	11/16/04	
(340)11	(340)11	WB Grading - Univ. to Guthrie, incl. Ret. Walls (E 9th to E 14th)	04/30/02	Previously Let
(340)11	(344)11	WB Exit at Univ. Bridge (over RR) Repl'mt.	04/30/02	Previously Let
(340)11	(347)11	E 21 St. WB Bridge (PPCB)Repl'mt.	04/30/02	Previously Let
(340)11	(349)11	Easton WB Bridge (Steel) - New, Incl. Pedestrian Overpass at Washington, Removal	04/30/02	Previously Let
(340)11	(406)12	Traffic Signals - at Guthrie Ave. (Ramp Terminals)	04/30/02	
(340)11	(472)11	Sanitary Sewer - Near Easton Blvd. & E 21 St.	04/30/02	Previously Let
(341)11		WB Paving - Univ. to Guthrie	03/18/03	
(342)11		Ramp G&P, WB exit to (& entr. From) WB Univ., EB exit to Univ.	01/25/05	
(345)14		EB Bridge over UPRR, Repl'mt.	11/16/04	
(346)14		WB Bridge over UPRR, Repl'mt.	10/21/03	
(348)11		E 21 St. EB Bridge Repl'mt. - incl. Ramp bridge	11/16/04	
(350)11		Easton EB Bridge (Steel) - New	11/16/04	
(351)11		Noise Wall - Easton to Guthrie (W side)	10/29/02	
(352)12		Guthrie Ave. Median Bridge	10/21/03	
(353)12		Guthrie Ave.EB Bridge Repl'mt.	11/16/04	
(356)12		Hull Ave. Median Bridge	10/21/03	
(357)12		Hull Ave EB Bridge Repl'mt.	11/16/04	
(359)13		Euclid Ave. Interchange Resurfacing, Bridge Repl'mt., Euclid Ave. Reconstruction	10/29/02	
(360)14		Broadway Ave. Median Bridge Widening	10/21/03	

(361)14		Broadway Ave. EB Bridge Deck Overlay	11/16/04	
(362)14		Bridge Widening over UPRR	10/21/03	
(363)14		UPRR EB Bridge Deck Overlay	11/16/04	
(364)0		Noise Wall from 56th St. to 42th St. (S. side)	10/21/03	
(364)0		Noise Wall (63rd Ramp A)	10/21/03	
(364)0		Noise Wall (42th St. Ramp A)	10/21/03	
(364)0		Noise Wall (31st to 28th, both side)	10/21/03	
(368)9		E 15th St Bridge WB Repl'mt.	11/15/05	
(372)11		WB ML G&P thru Univ. Int (incl Bridge over Univ & UPRR, different contractors)	10/21/03	
(373)2		Culvert Extension - 35th St. (W DsM)	01/14/03	
(375)2		Culvert Extension (28th St.)	01/15/02	Previously Let
(376)2		Culvert Extension (28th St. to 22nd St.)	01/27/04	
(377)3		Culvert Extension (E of 17th)	01/27/04	
(378)11		WB on Ramp from WB Univ – G&P	01/25/05	
(379)11		EB Exit ramp to EB Univ. - G&P	10/21/03	
(381)11		Easton Blvd. & ramps G&P	11/16/04	
(386)8		EB Exit bridge to 7th, 6th, 5th St, Repl'mt.	10/19/04	
(389)11		Easton to Guthrie Noise Wall (E side)	01/25/05	
(392)9		E 15th St Bridge Widening	12/12/03	
(393)3		22nd St EB ML Bridge Repl'mt.	10/19/04	
(403)3		Culvert Extension at 22nd St.	11/15/05	
(404)11		Noise Wall from E 16th to Walker (N side)	10/21/03	
(405)12		Noise Wall - S. of Hull Ave. (E. side, Morton to Sheridan)	10/21/03	
(405)12		Noise Wall - S. of Hull Ave. (W. side)	10/21/03	
(407)2		Center St. Noise Wall (N. Side)	10/21/03	
(409)4		Cummins Pkwy EB Bridge Repl'mt	11/16/04	
(410)3		17th St EB ML Bridge Repl'mt. (WDsM)	10/19/04	
(411)4		6" Resurfacing of 73rd St. Interchange - both sides	10/21/03	
(412)6		35th St EB ML Bridge Repl'mt	10/19/04	
(413)12		Guthrie Ave WB Bridge Repl'mt.	12/20/05	
(414)12		Hull Ave. WB Bridge Repl'mt.	11/15/05	
(415)14		Broadway Ave. WB Bridge Deck Overlay	11/15/05	

(416)14		UPRR WB Bridge Deck Overlay	11/15/05	
(423)4		Culvert Extension (0.25 km W of 56th)	09/16/03	
(425)2		Noise Wall (35th to 28th, S. side)	01/14/03	
(430)2		Reconstruction 35th St. Interchange	01/14/03	
(441)		ML Widen and Resurfacing (8") (EB/WB) [RUBBLIZING]	10/21/03	
(448)		17th St. Sideroad reconstruction	10/19/04	
(449)8	(449)8	19th St. G&P	01/14/03	
(449)8	(473)7	Traffic Signals Lighting - On MLK Blvd. & Cottage Grove	01/14/03	
(451)7		28th St. Sideroad Reconstruction	02/17/04	
(452)8		Ramps & CD Roads between 9th St. and DsM R.	10/21/03	
(453)5		56th St Interchange reconstruction	10/19/04	
(454)5		Culvert Extension (56th St.)	10/19/04	
(455)8		Keo Way Interchange & CD Roads (N. side)	12/20/05	
(456)12		Sanitary Sewer - On Thompson/Tichenor St.	06/04/02	Previously Let
(458)		Storm Sewer @ Maple	03/26/02	Previously Let
(460)8		Sanitary Sewer - Along School St From Keo To 18th St. (S. Side)	07/16/02	Previously Let
(461)8		Sanitary Sewer - Along Day St. From Keo To MLK(N. Side)	07/16/02	Previously Let
(462)10		Sanitary Sewer - At East High School & E. 14th St.	06/04/02	Previously Let
(465)8		Storm Sewer/Intakes - Birds Run Phase 1 From Des Moines River to 8th & Keo	10/29/02	
(466)		ST S/Intakes -- Birds Run Phase II (from DsM River to 8th & Keo)	08/19/03	
(467)		ST S/Intakes -- Deans Lake outfall. Along UPRR to Deans Lake	06/17/03	
(468)		Bridge Fence - E 6th	03/26/02	Previously Let
(469)2		Bridge Fence - In WDsM E to E 12th St in DsM (8 Bridges)	01/14/03	
(470)		Bridge Fence (63rd. St., 56th St., 31st. St, 9th St., 7th. St., 6th. Ave., E14th St.)	07/15/03	
(473)7		Traffic Signals Lighting - On MLK Blvd. & Cottage Grove	08/20/02	Previously Let
(474)		Water Work @ Washington Ave.	03/26/02	Previously Let

(476)		Demo. – Parcel 470	03/26/02	Previously Let
(477)8	(320)8	3rd St. Bridge Repl'mt	08/20/02	Previously Let
(477)8	(321)9	2nd Ave. Bridge Repl'mt., incl. Approach, School St. (3rd to DsM river)	08/20/02	Previously Let
(477)8	(322)9	Bridge widening (WB/EB) Ramp & ML over DsM River	08/20/02	Previously Let
(477)8	(477)8	Pavement(Replace) - At 2nd Ave./3rd St. & Ramps	08/20/02	Previously Let
(477)8	(485)	Roadway Item @ 2nd Ave/3rd St. & ramps	08/20/02	Previously Let
(478)		Demo. – Parcel 003-007	03/26/02	Previously Let
(479)		Reconstruct Univ. Ave.	07/20/04	
(482)		Demo. - 1050 16th, 1030 17th, 1701 WALKER, Des Moines. Specific locs are shown elsewhere in the contract documents	06/04/02	Previously Let
(484)8		Demolition - 1055 MLK & 1034 17th St, DsM.	07/16/02	Previously Let
(486)		Demolition - in Des Moines at various locations. Parcel no. 60, 100b, 100c, 104, 111 & 406	08/20/02	Previously Let
(487)		35th St. sideroad reconstruction	11/15/05	
(488)		Keo Way Interchange & CD Roads (S. side)	09/21/04	
(489)		G&P W/E River Drive	12/20/05	
(490)		Demolition at River Hills APTS., 5th St & Easton, DsM.	09/27/02	Previously Let
(491)		Traffic Signals On Euclid Ave. W & E Ramp Terminals	10/29/02	
(492)		Demolition at Various Locations Parcel No. 93, 105, 110C, 223, 705 221	10/29/02	

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