North Region ROW Tool Implementation Workshop

August 2, 2010 Dallas District Office





Welcome and Introductions





Workshop Objectives

- Introduce two new ROW acquisition software tools (TAMSIM and EROW) to additional district ROW personnel in region
- Share analysis of parcel acquisition possibilities for a Dallas District project
- Obtain feedback on tools from district ROW personnel





Tool Capabilities

· TAMSIM

- Determine Maximum Benefits on a Single Project
- Determine Parcel Priorities within a Project
- Determine Comparative Benefits from Various Parcel Selection Scenarios (Input Data Files for EROW)

EROW

- Determine Optimal Early Acquisition Budget Amount for Multiple Projects
- Determine Optimal Use of a Given Early Acquisition Budget





Introduction to Simulation





Simulation

Simulation is a statistical experiment where a computer model is designed to reproduce probabilistic events that are inherent in the system under consideration.





An Example

- ROW project involving four parcels
- Purchase time for parcels is random
 - Goal is to estimate average time at which construction can begin, i.e., when all parcels have been purchased





Probability Law for the Duration of a Parcel Purchase

- Twenty-five percent of the time parcel purchase takes <u>five</u> months
- Fifty percent of the time parcel purchase takes <u>ten</u> months
- Twenty-five percent of the time parcel purchase takes <u>twenty</u> months





Mathematical Description

- Let T be a random variable denoting the time duration for parcel acquisition
 - *Pr*{*T*=5 *mo*} = 25%
 - $Pr{T=10 mo} = 50\%$
 - *Pr*{*T*=20 *mo*} = 25%





Mathematical Description

- Let T be a random variable denoting the time duration for parcel acquisition
 - $Pr{T=5 mo} = 25\%$
 - $Pr{T=10 mo} = 50\%$
 - $Pr{T=20 mo} = 25\%$
- Average duration is 11.25 months
- Not equally likely, and not symmetric





Preparation for Simulation

- Let T be a random variable denoting the time duration for parcel acquisition
- Let two coin flips determine simulated time durations that occur
 - Pr{T=5 mo} = Tail-Tail
 - Pr{T=10 mo} = Head-Tail or Tail-Head
 - Pr{T=20 mo} = Head-Head





A Word about Statistics

Data

- > \$9,000, \$12,000, \$12,200, \$12,500, \$50,000
- Mean \$19,140
- Median \$12,200





TAMSIM Simulation Tool Walkthrough





Dallas County SH 78 Practical Exercise Using TAMSIM











| | 🖳 TAMSIM - Input of P | Project Information (F:\455340 RC | W AM\Meetings and Reports\ | North Region Workshop\TAMSIM Exer | _ _ × | |
|---------------------------|-----------------------|--|---|---|--------------|---|
| | File View Action | n Help | | | | |
| | | Pro | oject Inform | nation | | |
| | Pn | oject Description SH78 | | by Dallas District | | |
| | | Total Number of Parcels for the Proje | ect 7 | Number of Alignments 1 | | |
| | | Project Time Estimates from S | chematics Available Until En | vironmental Clearance, in months | | |
| | E | stimate of minimum | Estimate of most likely | Estimate of maximum | | |
| | | Project Time Estimates fr | om Environmental Clearance | to ROW Release, in months | | |
| | E | stimate of minimum | Estimate of most likely | Estimate of maximum | | |
| | | 2 | 4 | 12 | | |
| | | Project Target for Time from Target condition | Schematics Available Until a Penalty cost per day late (\$/day) | Il Parcels Purchased, in months Cost reduction per day early (\$/day) | | |
| | | | 100 Benefit of ear estimated to be costs divid | 100 y finish is somtimes : 30% of total project ed by 365 days. | | |
| | | south | Run Simulation | Quit | at | |
| Texas Trans Institu | portation Ite | l. men | tation Pro | ject 5-5534 | | Ú |

| 🖳 TAN | MSIM - Inpu | ut of Sim | ulation Settings (F:\455340 F | ROW AM\Meetings and Reports\North Re | egion Workshop\TAM |
|-------|-----------------|-----------|-------------------------------|--------------------------------------|------------------------|
| File | View | Action | Help | | |
| | | | | | |
| | | | Sim | ulation Settings | |
| | | | Nur | mber of replications 1000 | |
| | Nominal in | flation | Additional cost increase | Speculation begins | Offset for Speculation |
| | (76/yr 3.005 | 7 | due to speculation (%/yr) | Schemat 0) | ▼ no offset ▼ |
| | | Back to P | Project Info | ncer Into | Run Simulation |
| | | | | | ž |





🖷 TAMSIM - Input of Parcel Data (F:\455340 ROW AM\Meetings and Reports\North Region Workshop\TAMSIM Exercise\DallasDistrictExercise1.mdb)

File View Action Help

Parcel Information

(For Urban)

| | Num | ID | Associated Alignment | Likelihood of Condemnation | Likelihood of Improvements Beginning after Feasibility Study | Begin Time (months) for Improvement | Min Duration (months) for Improvement | Mode Duration (months) for Improvement | Max Duration (months) for Improvement | Cost Multiplier for Improvements | Select for Early Acquisition | Speculation Modeling Applies |
|---|-----|------------------------|-------------------------|-------------------------------|--|---|---|---|---|--|------------------------------------|------------------------------------|
| + | 1 | 78Commercial-1 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 2 | 78Commercial-2 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 3 | BearCreekCommercial-1 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 4 | Easement-BearCreekComm | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 5 | BearCreekCommercial-2 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 6 | Edward Cappy Trotter | 1 | 0.2 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 7 | Unknown | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | V |



Back to

Set

Implementation Project 5-5534

cond Parcel

Screen



Simulate

Quit

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🖳 TAMSIM - Input of Parcel Data (F:\455340 ROW AM\Meetings and Reports\North Region Workshop\TAMSIM Exercise\DallasDistrictExercise1.mdb)

File View Action Help

Parcel Information

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Likelihood of Improvements Mode Beginning Begin Time Min Duration Duration Max Duration Cost Multiplier Select for Speculation after Feasibility Likelihood of (months) for (months) for (months) for (months) for Early Modeling Associated for Num ID Alignment Condemnation Study Improvement Improvement Improvement Improvement Improvements Acquisition Applies 1 1 78Commercial-1 1 0.5 0.7 4 12 24 60 2 1 ٠ 1 2 78Commercial-2 1 0.5 0.7 4 12 24 60 2 1 3 BearCreekCommercial-1 1 0.2 0.7 12 24 60 2 1 4 J Easement-BearCreekComm 1 0.2 07 4 12 24 60 2 4 5 BearCreekCommercial-2 1 0.2 0.7 4 12 24 60 2 6 Edward Cappy Trotter 1 02 0 0 7 0 0 0 Unknown 1 0.5 0 0 0 0 0 0 0 0 8 New Parcel-8 1 1





Implementation Project 5-5534



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File View Action Help

Parcel Information

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| | Num | ID | Associated Alignment | Likelihood of Condemnation | Likelihood of Improvements Beginning after Feasibility Study | Begin Time (months) for Improvement | Min Duration (months) for Improvement | Mode Duration (months) for Improvement | Max Duration (months) for Improvement | Cost Multiplier for Improvements | Select for Early Acquisition | Speculation Modeling Applies |
|---|-----|------------------------|-------------------------|-------------------------------|--|---|---|---|---|--|------------------------------------|------------------------------------|
| | 1 | 78Commercial-1 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 2 | 78Commercial-2 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 3 | BearCreekCommercial-1 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 4 | Easement-BearCreekComm | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 5 | BearCreekCommercial-2 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 6 | Edward Cappy Trotter | 1 | 0.2 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 7 | Unknown | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| • | 8 | Joint Venture | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | V |



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File View Action Help

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|---|-----|------------------------|-------------------------|-------------------------------|--|---|---|---|---|--|------------------------------------|------------------------------------|
| | 1 | 78Commercial-1 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 2 | 78Commercial-2 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 3 | BearCreekCommercial-1 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 4 | Easement-BearCreekComm | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 5 | BearCreekCommercial-2 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 6 | Edward Cappy Trotter | 1 | 0.2 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 7 | Unknown | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 8 | Joint Venture | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | |
| • | 9 | New Parcel-9 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | |







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Back to

File View Action Help

Parcel Information

(For Urban)

| | Num | ID | Associated Alignment | Likelihood of Condemnation | Likelihood of Improvements Beginning after Feasibility Study | Begin Time (months) for Improvement | Min Duration (months) for Improvement | Mode Duration (months) for Improvement | Max Duration (months) for Improvement | Cost Multiplier for Improvements | Select for Early Acquisition | Speculation Modeling Applies |
|---|-----|------------------------|-------------------------|-------------------------------|--|---|---|---|---|--|------------------------------------|------------------------------------|
| | 1 | 78Commercial-1 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 2 | 78Commercial-2 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 3 | BearCreekCommercial-1 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 4 | Easement-BearCreekComm | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 5 | BearCreekCommercial-2 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 6 | Edward Cappy Trotter | 1 | 0.2 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 7 | Unknown | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 8 | Joint Venture | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| Þ | 9 | William Boyd | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 6 | | V |



Implementation Project 5-5534

Second Parcel

ta Screen



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File View Action Help

Parcel Information

(For Urban)

| | Num | ID | Associated Alignment | Likelihood of Condemnation | Likelihood of Improvements Beginning after Feasibility Study | Begin Time (months) for Improvement | Min Duration (months) for Improvement | Mode Duration (months) for Improvement | Max Duration (months) for Improvement | Cost Multiplier for Improvements | Select for Early Acquisition | Speculation Modeling Applies |
|---|-----|------------------------|-------------------------|-------------------------------|--|---|---|---|---|--|------------------------------------|------------------------------------|
| | 1 | 78Commercial-1 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 2 | 78Commercial-2 | 1 | 0.5 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 3 | BearCreekCommercial-1 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 4 | Easement-BearCreekComm | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 5 | BearCreekCommercial-2 | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 2 | V | V |
| | 6 | Edward Cappy Trotter | 1 | 0.2 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 7 | Unknown | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 8 | Joint Venture | 1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1 | | V |
| | 9 | William Boyd | 1 | 0.2 | 0.7 | 4 | 12 | 24 | 60 | 6 | V | V |
| • | 10 | New Parcel-10 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | |





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File View Action Help

Parcel Information

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Likelihood of Improvements Mode Beginning Begin Time Min Duration Duration Max Duration Cost Multiplier Select for Speculation Modeling Associated Likelihood of after Feasibility (months) for (months) for (months) for (months) for for Early ID Study Num Alignment Condemnation Improvement Improvement Improvement Improvement Improvements Acquisition Applies 1 78Commercial-1 1 0.5 0.7 4 12 24 60 2 1 1 2 0.7 12 2 V 1 78Commercial-2 1 0.5 4 24 60 3 BearCreekCommercial-1 0.7 4 12 24 2 1 1 1 0.2 60 1 1 4 Easement-BearCreekComm 1 0.2 0.7 4 12 24 60 2 2 1 1 5 BearCreekCommercial-2 1 0.2 07 4 12 24 60 1 6 Edward Cappy Trotter 1 0.2 0 0 0 0 7 0 0 0 0 1 Unknown 1 0.5 0 1 1 8 Joint Venture 1 0.5 0 0 1 1 9 0.2 0.7 24 60 6 William Boyd 1 4 10 1 0.2 0.7 4 24 60 6 1 **V** Meredith Roark





Implementation Project 5-5534



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Data Screen

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File View Help Action

Parcel Information - Continued

(For Urban)

| | Name | from ROW Release to Possession in months | from ROW Release to Possession in months | Duration from ROW Release to Possession in months | Duration from ROW Release to Possession in months | Duration from ROW Release to Possession in months | for Duration for condemn | (land, improve, damage x\$1000) | (land, improve, damage x\$1000) | (land, improve, damage x\$1000) | (land, improve, damage x\$1000) |
|----|---|--|--|---|--|--|--|--|---|--|--|
| 0 | Standard Project Parcel | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.000 | 82.1 | 97.1 | 97.6 | 10.0 |
| 1 | 78Commercial-1 | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.500 | 0.3 | 2.2 | 5.0 | 10.0 |
| 2 | 78Commercial-2 | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.500 | 1.3 | 5.8 | 8.8 | 10.0 |
| 3 | BearCreekCommercial-1 | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.500 | 1.6 | 6.5 | 9.5 | 10.0 |
| 4 | Easement-BearCreekComm | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.500 | 26.4 | 39.3 | 40.5 | 10.0 |
| 5 | BearCreekCommercial-2 | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.500 | 0.1 | 1.3 | 3.8 | 10.0 |
| 6 | Edward Cappy Trotter | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.000 | 0.0 | 0.1 | 1.0 | 10.0 |
| 7 | Unknown | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.000 | 23.5 | 36.2 | 37.5 | 10.0 |
| 8 | Joint Venture | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.000 | 23.5 | 36.2 | 37.5 | 10.0 |
| 9 | William Boyd | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.000 | 23.5 | 36.2 | 37.5 | 10.0 |
| 10 | Meredith Roark | 8.4 | 11.7 | 12.0 | 2.5 | 16.5 | 1.000 | 23.5 | 36.2 | 37.5 | 10.0 |
| | · | | | | | | | | | | Þ |
| | 0 1 2 3 4 5 6 7 7 8 9 10 | 0 Standard Project Parcel 1 78Commercial-1 2 78Commercial-2 3 BearCreekCommercial-1 4 Easement-BearCreekComm 5 BearCreekCommercial-2 6 Edward Cappy Trotter 7 Unknown 8 Joint Venture 9 William Boyd 10 Meredith Roark | in months 0 Standard Project Parcel 8.4 1 78Commercial-1 8.4 2 78Commercial-2 8.4 3 BearCreekCommercial-1 8.4 4 Easement-BearCreekComm 8.4 5 BearCreekCommercial-2 8.4 6 Edward Cappy Trotter 8.4 7 Unknown 8.4 8 Joint Venture 8.4 9 William Boyd 8.4 10 Meredith Roark 8.4 | in months in months 0 Standard Project Parcel 8.4 11.7 1 78Commercial-1 8.4 11.7 2 78Commercial-2 8.4 11.7 3 BearCreekCommercial-1 8.4 11.7 4 Easement-BearCreekComm 8.4 11.7 5 BearCreekCommercial-2 8.4 11.7 6 Edward Cappy Trotter 8.4 11.7 7 Unknown 8.4 11.7 8 Joint Venture 8.4 11.7 9 William Boyd 8.4 11.7 10 Meredith Roark 8.4 11.7 | in months in months in months in months in months 0 Standard Project Parcel 8.4 11.7 12.0 1 78Commercial-1 8.4 11.7 12.0 2 78Commercial-2 8.4 11.7 12.0 3 BearCreekCommercial-1 8.4 11.7 12.0 4 Easement-BearCreekComm 8.4 11.7 12.0 5 BearCreekCommercial-2 8.4 11.7 12.0 6 Edward Cappy Trotter 8.4 11.7 12.0 7 Unknown 8.4 11.7 12.0 8 Joint Venture 8.4 11.7 12.0 9 William Boyd 8.4 11.7 12.0 10 Meredith Roark 8.4 11.7 12.0 | in months in months in months in months in months 0 Standard Project Parcel 8.4 11.7 12.0 2.5 1 78Commercial-1 8.4 11.7 12.0 2.5 2 78Commercial-2 8.4 11.7 12.0 2.5 3 BearCreekCommercial-1 8.4 11.7 12.0 2.5 4 Easement-BearCreekComm 8.4 11.7 12.0 2.5 5 BearCreekCommercial-2 8.4 11.7 12.0 2.5 6 Edward Cappy Trotter 8.4 11.7 12.0 2.5 7 Unknown 8.4 11.7 12.0 2.5 8 Joint Venture 8.4 11.7 12.0 2.5 9 William Boyd 8.4 11.7 12.0 2.5 10 Meredith Roark 8.4 11.7 12.0 2.5 | In months 0 Standard Project Parcel 8.4 11.7 12.0 2.5 16.5 1 78Commercial-1 8.4 11.7 12.0 2.5 16.5 2 78Commercial-2 8.4 11.7 12.0 2.5 16.5 3 BearCreekCommercial-1 8.4 11.7 12.0 2.5 16.5 4 Easement-BearCreekComm 8.4 11.7 12.0 2.5 16.5 5 BearCreekCommercial-2 8.4 11.7 12.0 2.5 16.5 6 Edward Cappy Trotter 8.4 11.7 12.0 2.5 16.5 7 Unknown 8.4 11.7 12.0 2.5 16.5 8 Joint Venture 8.4 11.7 12.0 2.5 16.5 9 William Boyd 8.4 11.7 12.0 2.5 16.5 | In months in months | In months months condent x stody 0 Standard Project Parcel 8.4 11.7 12.0 2.5 16.5 1.000 82.1 1 78Commercial-1 8.4 11.7 12.0 2.5 16.5 1.500 0.3 2 78Commercial-2 8.4 11.7 12.0 2.5 16.5 1.500 1.3 3 BearCreekCommercial-1 8.4 11.7 12.0 2.5 16.5 1.500 1.6 4 Easement-BearCreekComm 8.4 11.7 12.0 2.5 16.5 1.500 0.1 6 Edward Cappy Trotter 8.4 11.7 12.0 2.5 16.5 1.000 0.0 7 Unknown 8.4 11.7 12.0 2.5 16.5 1.000 23.5 8 Joint Venture 8.4 11.7 12.0 2.5 16.5 1.00 | In months in months in months in months in months months in months <t< td=""><td>in months in months in months in months in months in months in months in months</td></t<> | in months in months |





File View Action Help

Parcel Information - Continued

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(For Urban)

| | Parcel Num | Name | n N to on s | StDev Duration from ROW Release to Possession in months | Max-95% Duration from ROW Release to Possession in months | Multiplier for Duration for condemn | MinCost (land, improve, damage x\$1000) | MedCost (land, improve, damage x\$1000) | MeanCost (and, improve, damage x\$1000) | StDevCost (land, improve, damage x\$1000) | Max-95% Cost (land, improve, damage x\$1000) | Multiplier of Cost for condemn |
|---|---------------|--------------------------------------|-------------------------|--|--|---|---|---|---|---|--|--------------------------------------|
| | 0 | Standard Project Parcel | | 2.5 | 16.5 | 1.000 | 82.1 | 97.1 | 97.6 | 10.0 | 114.9 | 1.500 |
| | 1 | 78Commercial-1 | | 2.5 | 16.5 | 1.500 | 0.3 | 2.2 | 5.0 | 10.0 | 18.0 | 1.500 |
| | 2 | 78Commercial-2 | | 2.5 | 16.5 | 1.500 | 1.3 | 5.8 | 8.8 | 10.0 | 25.9 | 1.500 |
| | 3 | BearCreekCommercial-1 | | 2.5 | 16.5 | 1.500 | 1.6 | 6.5 | 9.5 | 10.0 | 27.1 | 1.500 |
| | 4 | Easement-BearCreekComm | | 2.5 | 16.5 | 1.500 | 26.4 | 39.3 | 40.5 | 10.0 | 58.7 | 1.500 |
| | 5 | BearCreekCommercial-2 | | 2.5 | 16.5 | 1.500 | 0.1 | 1.3 | 3.8 | 10.0 | 14.2 | 1.500 |
| | 6 | Edward Cappy Trotter | | 2.5 | 16.5 | 1.000 | 0.0 | 0.1 | 1.0 | 10.0 | 3.4 | 1.500 |
| | 7 | Unknown | | 2.5 | 16.5 | 1.000 | 23.5 | 36.2 | 37.5 | 10.0 | 55.8 | 1.500 |
| | 8 | Joint Venture | | 2.5 | 16.5 | 1.000 | 33.5 | 47.0 | 48.0 | 10.0 | 66.0 | 1.500 |
| | 9 | William Boyd | | 2.5 | 16.5 | 1.500 | | 8.5 | 11.3 | 10.0 | 29.6 | 1.500 |
| + | 10 | Meredith Roark | | 2.5 | 16.5 | 1.50 | | 60.0 | 60.8 | 10.0 | 78.5 | 1.500 |
| • | | | Back to I Data | First Parcel Screen | | | - | | Quit | | | • |
| | | Texas Transportation Institute | | Imple | ement | ati | Je | ct 5-55 | 534 | | TP | |

| 📱 TAMSIM - Summarized Output (F:\455340 ROW AM\Meetings and Reports\North Region Workshop\TAMSIM Exercise\DallasDistrictExercise1.mdb) | | | | | | | | |
|--|--------------------------------|---------------------------|--------------|--------------------------------------|----|--|--|--|
| File View Help | | | | | | | | |
| | 5 | Summary for "SH7 | 78" | | | | | |
| Time refers to the span of time from the availability of the schematics to when all parcels have been purchased. | he 1 | No Early Acquisition | ı | | | | | |
| | 95% confidence interval | | | 95% confidence interval | | | | |
| mean time (months): 51.2 | +/- 0.3 | mean cost | \$635,974 | +/- \$9,766 | | | | |
| median time (months) 51.0 | + 0.5 or -0.5 | median cost | \$646,856 | +\$472,176 or \$444,188 | | | | |
| min-10% time (months) 43 | max-90% time (months) 60 | min-10% cost | \$372,711 | max-90% cost \$858,247 | | | | |
| | In | npact of Early Acquisi | tion | | | | | |
| | | 7 parcels purchased early | ר | | | | | |
| | 95% confidence interval | | | 95% confidence interval | | | | |
| difference in mean time -5.9 | +/- 0.2 | difference in mean cost | -\$332,844 | +/- \$7,942 | | | | |
| difference in median -5.7 | | difference in median | -\$361,089 | | | | | |
| min-10% time -11.1 | max-90% time -0.5 | min-10% cost | -\$506,931 | max-90% cost -\$106,443 | | | | |
| | | _ | Note: a nega | tive difference in the st reduction. | | | | |
| mean cost of early acquisi | itions 95% confidence interval | | | | | | | |
| \$183,803 | +/- \$2,655 | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Run Date: 7/29/2010 3:09:30 AM | CPU Time: 0.61 sec. by Dalla. | s District | | | | | | |
| | | | | | | | | |
| Texas Transportation Institute | Impleme | ntation Proje | ect v | | TE | | | |









Introduction to Optimization





Introduction to Optimization

- Optimization is derived from the Latin word "optimus," meaning the best.
- Organizations are striving to streamline their business processes to maximize utility of resources.
 INPUTS
 Business Processes
 OUTPUTS

· <u>What is the best (optimal) way of using</u> resizeres (englementation for the former for the former of the former for the former of the former

Example

• We have 5 projects to choose from.

| Project | 1 | 2 | 3 | 4 | 5 |
|----------------|----|----|----|---|----|
| Cost, \$ | 10 | 24 | 14 | 5 | 7 |
| Net profit, \$ | 20 | 60 | 25 | 9 | 15 |

The total budget available is \$40.
 Which ones would you choose?





| Projects Selected | Total Cost of Projects Selected | Total Profits from Projects Selected | Benefit/Cost Ratio |
|----------------------|---------------------------------------|--|-----------------------|
| 2,3 | | | |
| 1,2,4 | | | |
| 1,3,4,5 | | | |
| 2,4,5 | | | |





| Projects Selected | Total Cost of Projects Selected | Total Profits from Projects Selected | Benefit/Cost Ratio |
|----------------------|---------------------------------------|--|-----------------------|
| 2,3 | \$38 | \$85 | 2.24 |
| 1,2,4 | | | |
| 1,3,4,5 | | | |
| 2,4,5 | | | |





| Projects Selected | Total Cost of Projects Selected | Total Profits from Projects Selected | Benefit/Cost Ratio |
|----------------------|---------------------------------------|--|-----------------------|
| 2,3 | \$38 | \$85 | 2.24 |
| 1,2,4 | \$39 | \$89 | 2.28 |
| 1,3,4,5 | | | |
| 2,4,5 | | | |





| Projects Selected | Total Cost of Projects Selected | Total Profits from Projects Selected | Benefit/Cost Ratio |
|----------------------|---------------------------------------|--|-----------------------|
| 2,3 | \$38 | \$85 | 2.24 |
| 1,2,4 | \$39 | \$89 | 2.28 |
| 1,3,4,5 | \$36 | \$69 | 1.92 |
| 2,4,5 | | | |





| Projects Selected | Total Cost of Projects Selected | Total Profits from Projects Selected | Benefit/Cost Ratio |
|----------------------|---------------------------------------|--|-----------------------|
| 2,3 | \$38 | \$85 | 2.24 |
| 1,2,4 | \$39 | \$89 | 2.28 |
| 1,3,4,5 | \$36 | \$69 | 1.92 |
| 2,4,5 | \$36 | \$84 | 2.33 |





Optimization

- Optimization falls in the category of decision support tools.
- Involves building a mathematical model of business processes and solve the model to find the best (optimal) input mix to achieve the stated objective.
- The solution is obtained by systematically choosing values of decision variables within their mplementation Project 5-5534



Optimization

- There are different optimization methods/algorithms:
 - nonlinear programming,
 - · linear programming,
 - mixed integer programming,
 - · dynamic programming, etc.





Dynamic Programming

- A method of solving optimization problems that exhibit a special structure.
- The problem is divided into a sequence of overlapping sub problems and the solution from one is used to solve the next one.
- When compared with total enumeration of all solutions, dynamic
 - pragamming certisignificatily reduce

EROW Optimization Tool Walkthrough





EROW Practical Exercise





TAMSIM Output for EROW

| 🔜 TAMSIM - Summarized Output (C | C:\Documents and Settings\p-krugler\Desk | .top\TAMSIM 1.1 (07142010)\TAMSIM | _folder\DallasDistrict_v20riginal.mdb) | |
|---|--|---|--|---|
| File View Help | | | | |
| | Summary for "S | H78 from SH205 to | FM6" | |
| Time refers to the span of time from th availability of the schematics to when all parcels have been purchased. | e No I | Early Acquisition 0 total parcels purchased | | |
| mean time (months): 51.2 | - 95% confidence interval +/- 0.3 | mean cost \$580,593 | 95% confidence interval +/- \$9,743 | |
| median time (months) 51.0 | + 0.5 or -0.5 | median cost \$591,033 | +\$417,940 or \$389,082 | |
| min-10% time (months) 43 | max-90% time (months) 60 | min-10% cost \$312,048 | max-90% cost \$810,173 | |
| | Impact | of Early Acquisition | | _ |
| | | 7 parcels purchased early | | |
| | 95% confidence interval | | | |
| difference in mean time -5.9 | +/- 0.2 | difference in mean cost\$332,489 | +/- \$7,936 | |
| difference in median -5.7 | | difference in median -\$360,842 | | |
| min-10% time -11.1 | max-90% time -0.5 | min-10% cost -\$506,416 | max-90% cost -\$106,168 | |
| | | Note: a negati | ve difference is a cost reduction. | |
| mean cost of early acquisiti \$183,659 | +/- \$2,654 | | | |
| | | Reset Data | Quit | |
| Run Date: 7/30/2010 11:52:52 AM | CPU Time: 0.70 sec. by Dallas District | Output | t for ERDW | |





Standard TAMSIM Runs for EROW Optimization

- A series of TAMSIM runs to determine individual parcel costs and savings should each parcel alone be purchased early.
- A series of TAMSIM runs to determine costs and savings of groupings of parcels. Parcel groupings are created based on individual parcel rates of return, from highest to lowest.





TAMSIM Runs and Output for SH78

| | | Sp | eculation Begins: | Schematics Av | ailable (Time | e 0) | | | |
|--|--------------|--|--------------------------------|---|---|--------------------------------------|---------------------------------------|----------------------------|----------------------|
| | | Additio | onal Cost Increase | Due to Specu | lation (%/yr): | 15.00% | | | |
| | | Selected Inpu | ut Conditions | OUTPU | T: Mean Projec | t Cost | OUTPUT | : Duration | |
| Project Identification Number (ROW CSJ Number) | Scenario No. | Number of Parcels for Early Acquisition | Early Acquisition Parcel ID | Mean Cost without early acquisition | Difference in Mean Cost due to early acquisition | Mean Cost of Early Acquisition | Mean Time w/o early acquisition | Difference in Mean Time | Saving/Cost Ratio |
| | D01 | 1 | 1 | \$787,793 | \$9,182 | \$6,777 | 50.5 | 0.7 | 1.35 |
| | D02 | 1 | 2 | \$787,793 | \$15,768 | \$12,888 | 50.5 | 0.7 | 1.22 |
| | D03 | 1 | 3 | \$787,793 | \$14,119 | \$11,999 | 50.5 | 0.3 | 1.18 |
| | D04 | 1 | 4 | \$787,793 | \$56,950 | \$51,332 | 50.5 | 0.3 | 1.11 |
| | D05 | 1 | 5 | \$787,793 | \$5,696 | \$4,497 | 50.5 | 0.3 | 1.27 |
| | D06 | 1 | 6 | \$787,793 | \$708 | \$999 | 50.5 | 0.0 | 0.71 |
| | D07 | 1 | 7 | \$787,793 | \$39,405 | \$66,346 | 50.5 | 0.0 | 0.59 |
| Dallas SH78 fron | D08 | 1 | 8 | \$787,793 | \$38,173 | \$64,470 | 50.5 | 0.0 | 0.59 |
| SH205 to FM6 | D09 | 1 | 9 | \$787,793 | \$44,653 | \$16,781 | 50.5 | 0.3 | 2.66 |
| | D10 | 1 | 10 | \$787,793 | \$241,934 | \$91,813 | 50.5 | 0.3 | 2.64 |
| (| D11 | 2 | 9, 10 | \$787,793 | \$286,675 | \$108,593 | 50.5 | 0.6 | 2.64 |
| | D12 | 3 | 9, 10,1 | \$787,793 | \$296,380 | \$115,371 | 50.5 | 1.5 | 2.57 |
| | D13 | 4 | 9, 10,1,5 | \$787,793 | \$302,611 | \$119,868 | 50.5 | 1.9 | 2.52 |
| | D14 | 5 | 9, 10,1,5,2 | \$787,793 | \$320,446 | \$132,756 | 50.5 | 3.5 | 2.41 |
| | D15 | 6 | 9, 10,1,5,2,3 | \$787,793 | \$336,302 | \$144,756 | 50.5 | 4.4 | 2.32 |
| | D16 | 7 | 9, 10,1,5,2,3,4 | \$787,793 | \$395,963 | \$196,087 | 50.5 | 5.7 | 2.02 |





EROW Input Files







| EROW Optimization | | | |
|--|--------------------|---------|-----------------------|
| INPUT DATA | | RESULTS | Help About |
| EARLY ACQUISITION BUDGET (\$) | DATA (\$) Costs | | Add Cost Data Reset |
| Maximum Budget Minimum Budget Increment | | | |
| RESULTS OPTIONS | | | |
| Display Selected Project Scenarios Apply Incremental Analysis with MARR MARR 25 % (Minimum Attractive Rate of Return) | Savings | | Add Saving Data Reset |
| STATUS No costs or savings data is read | | SOLVE | |





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|------------------------|------------------------|--------------------|---|------------------|--------------|--|
| Look jn: | 🗁 EROW 1.1 (07.2 | 20.2010) | G | ا 🗠 对 | | |
| My Recent Documents | Costs-SH78.txt | | | | | |
| Desktop | | | | | | |
| My Documents | | | | | | |
| My Computer | | | | | | |
| | File <u>n</u> ame: | | | ~ | <u>O</u> pen | |
| My Network | Files of <u>type</u> : | Fext files (*.txt) | | ~ | Cancel | |





| INPUT DATA | RESUL | TS | | | Н | elp Abo |
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| ARLY ACQUISITION BUDGET (\$) | DATA (\$) Costs | | | | Add Cost Data | Reset |
| Maximum Budget | | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scena |
| Minimum Budant | FM 973 - Austin | 0 | 1126135 | 976620 | 421476 | 104 |
| Minimum Budget | SH78 from SH205 to FM6 | 0 | 6777 | 12888 | 11999 | 51332 |
| Tt | NE PARKWAY EL PASO DISTR | 0 | 1284593 | 42493 | 69891 | 1163 |
| Increment | Houston FM 1488 | 0 | 124212 | 183057 | 590947 | 14078 |
| | * | | | | | |
| Apply Incremental Analysis with MARR MARR 25 % (Minimum Attractive Rate of Return) | Savings | | | | Add Saving Data | Reset |
| | | | | | | |





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| Look jn: | 🚞 EROW 1.1 (0 | 7.20.2010) | X | G 🤌 📂 🛄- | | |
| My Recent Documents | Cocts SH78 by Savings-SH78. | txt | | | | |
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| My Documents | | | | | | |
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| Maximum Budge | | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scena |
| Minimum Rudan | FM 973 - Austin | 0 | 1126135 | 976620 | 421476 | 104 |
| | SH78 from SH205 to FM6 | 0 | 6777 | 12888 | 11999 | 51332 |
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| Increment | Houston FM 1488 | 0 | 124212 | 183057 | 590947 | 14078 |
| | | | | | | |
| RESULTS OPTIONS | * | | | ۔ ا | | |
| Contract Selected Project Scenarios Apoly Incremental Analysis with MARR | * < | | | | Add Saving Data | Reset |
| ESULTS OPTIONS Display Selected Project Scenarios Apply Incremental Analysis with MARR | * | Scenario 1 | Scenario 2 | Scenario 3 | Add Saving Data Scenario 4 | Reset Scena |
| ESULTS OPTIONS Display Selected Project Scenarios Apply Incremental Analysis with MARR MARR 25 % | * Savings FM 973 - Austin | Scenario 1 0 | Scenario 2 199673 | Scenario 3 179866 | Add Saving Data Scenario 4 90302 | Reset Scena 55 |
| ESULTS OPTIONS Display Selected Project Scenarios Apply Incremental Analysis with MARR MARR 25 % | * Savings FM 973 - Austin SH78 from SH205 to FM6 | Scenario 1 0 0 | Scenario 2 199673 9182 | Scenario 3 179866 15768 | Add Saving Data Scenario 4 90302 14119 | Reset Scena 55 56950 |
| RESULTS OPTIONS Display Selected Project Scenarios Apply Incremental Analysis with MARR MARR 25 % (Minimum Attractive Rate of Return) | * Savings FM 973 - Austin SH78 from SH205 to FM6 NE PARKWAY EL PASO DIST | Scenario 1 0 0 0 | Scenario 2 199673 9182 2224 | Scenario 3 179866 15768 526 | Add Saving Data Scenario 4 90302 14119 475 | Reset Scena 55 56950 0 |
| RESULTS OPTIONS Display Selected Project Scenarios Apply Incremental Analysis with MARR MARR 25 % (Minimum Attractive Rate of Return) | * Savings FM 973 - Austin SH78 from SH205 to FM6 NE PARKWAY EL PASO DIST Houston FM 1488 | Scenario 1 0 0 0 0 0 | Scenario 2 199673 9182 2224 60267 | Scenario 3 179866 15768 526 172791 | Add Saving Data Scenario 4 90302 14119 475 287971 | Reset Scena 55 56950 0 84416 |
| RESULTS OPTIONS Image: Selected Project Scenarios Image: Apply Incremental Analysis with MARR MARR 25 MARR 25 (Minimum Attractive Rate of Return) | FM 973 - Austin FM 973 - Austin SH78 from SH205 to FM6 NE PARKWAY EL PASO DIST Houston FM 1488 * | Scenario 1 0 0 0 0 0 | Scenario 2 199673 9182 2224 60267 | Scenario 3 179866 15768 526 172791 | Add Saving Data Scenario 4 90302 14119 475 287971 | Reset Scena 55 56950 0 84416 |
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| RESULTS OPTIONS | * Savings FM 973 - Austin SH78 from SH205 to FM6 NE PARKWAY EL PASO DIST Houston FM 1488 * | Scenario 1 0 0 0 0 0 | Scenario 2 199673 9182 2224 60267 | Scenario 3 179866 15768 526 172791 | Add Saving Data Scenario 4 90302 14119 475 287971 | Reset Scena 55 56950 0 84416 |

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| IN | NPUT DATA | | RESULTS | | | H | elp Ab |
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| ARLY ACQUISITIO | N BUDGET (¢) | DATA (\$) | | | | | |
| | | Costs | | | | Add Cost Data | Reset |
| Maximum Budger | \$15,000,000 | | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scena |
| Minimum Rudant | | FM 973 - Austin | 0 | 1126135 | 976620 | 421476 | 104 |
| Minimum Budget | \$1,000 | SH78 from SH205 | to FM6 0 | 6777 | 12888 | 11999 | 51332 |
| | ¢1.000 | NE PARKWAY EL F | ASO DISTR 0 | 1284593 | 42493 | 69891 | 11630 |
| Increment | \$1,000 | Houston FM 1488 | 0 | 124212 | 183057 | 590947 | 14078 |
| (Entor > number | (000000 > - bac 04 | Ψ. | | | | | |
| RESULTS OPTIONS | Project Scenarios | * | | | | | |
| RESULTS OPTIONS | Project Scenarios | * | | | | Add Saving Data | Reset |
| RESULTS OPTIONS Image: Contract of the second se | Project Scenarios al Analysis with MARR | * Savings | Scenario 1 | Scenario 2 | Scenario 3 | Add Saving Data Scenario 4 | Reset |
| ESULTS OPTIONS | Project Scenarios al Analysis with MARR | ★ ✓ Ⅲ Savings FM 973 - Austin | Scenario 1 0 | Scenario 2 199673 | Scenario 3 179866 | Add Saving Data Scenario 4 90302 | Reset |
| ESULTS OPTIONS | Project Scenarios al Analysis with MARR 25 % | * III Savings FM 973 - Austin SH78 from SH205 | Scenario 1 0 to FM6 0 | Scenario 2 199673 9182 | Scenario 3 179866 15768 | Add Saving Data Scenario 4 90302 14119 | Reset Scen 55 56950 |
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| ESULTS OPTIONS Display Selected Apply Incrementa MARR (Minimum Attrac | Project Scenarios al Analysis with MARR 25 % ctive Rate of Return) | * Savings FM 973 - Austin SH78 from SH205 NE PARKWAY EL F Houston FM 1488 | to FM6 0 PASO DISTR 0 0 | Scenario 2 199673 9182 2224 60267 | Scenario 3 179866 15768 526 172791 | Add Saving Data Scenario 4 90302 14119 475 287971 | Reset Scen 55 56950 0 84416 |
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| EARLY ACQUISITION | N BUDGET (\$) | | ΓA (\$) | | | | | |
| | | Cost | ts | | | | Add Cost Data | Reset |
| Maximum Budget | \$15,000,000 | | | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scena |
| Minimum Budget | ±1.000 | • | FM 973 - Austin | 0 | 1126135 | 976620 | 421476 | 104 |
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| Increment | \$1.000 | | NE PARKWAY EL PASO DISTR | 0 | 1284593 | 42493 | 69891 | 11630 |
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| (Enter number > | 49 and =< \$290000) | ÷ | * | | | | | |
| RESULTS OPTIONS | Project Scenarios | | | | | | | |
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| RESULTS OPTIONS Display Selected I Apply Incrementa MARR | Project Scenarios I Analysis with MARR | Savi | ngs FM 973 - Austin | Scenario 1 0 | Scenario 2 199673 | Scenario 3 179866 | Add Saving Data Scenario 4 90302 | Reset Scena 55 |
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| RESULTS OPTIONS | Project Scenarios I Analysis with MARR 25 % tive Rate of Return) | Slavi | Mgs FM 973 - Austin SH78 from SH205 to FM6 NE PARKWAY EL PASO DISTR Houston FM 1488 | Scenario 1 0 0 0 0 0 | Scenario 2 199673 9182 2224 60267 | Scenario 3 179866 15768 526 172791 | Add Saving Data Scenario 4 90302 14119 | Reset Scena 55 56950 0 1416 |
| RESULTS OPTIONS | Project Scenarios I Analysis with MARR 25 % tive Rate of Return) | Sevi • | THE INTERNATION OF THE INTERNATION INT | Scenario 1 0 0 0 0 0 | Scenario 2 199673 9182 2224 60267 | Scenario 3 179866 15768 526 172791 | Add Saving Data Scenario 4 90302 14119 47 | Reset Scena 55 56950 0 1416 |
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| RESULTS OPTIONS Display Selected I Apply Incrementa MARR (Minimum Attrac STATUS Data Pro | Project Scenarios I Analysis with MARR 25 % tive Rate of Return) | Stavi | TII TII TII TII TII TII TII TII | Scenario 1 0 0 0 0 | Scenario 2 199673 9182 2224 60267 | Scenario 3 179866 15768 526 172791 | Add Saving Data Scenario 4 90302 14119 42 | Reset Scena 55 56950 0 1416 |

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| INPO | T DATA | | R | ESULTS | | | | Help |
|------------------|------------------------------|----------------------|-----------------------|--------------------|------------------------------|--------------------------------|--------------------|------|
| BUDGET OPTION | RESULTING | RESULTING SAVINGS | RATE OF RETURN (3) | FM 973 - Austin | SH78 from SH205 to FM6 | NE PARKWAY EL PASO DISTR | Houston FM 1488 | |
| \$1,000 | \$286 | \$825 | 288.46 | Scenario 22 | Not Selected | Not Selected | Not Selected | |
| \$2,000 | \$1,285 | \$1,532 | 119.30 | Scenano 22 | Scenario 7 | Not Selected | Not Selected | |
| \$5,000 | \$4,497 | \$5,696 | 126.66 | Not Selected | Scenario 6 | Not Selected | Not Selected | |
| \$6,000 | \$4,783 | \$6,521 | 136.34 | Scenario 22 | Scenario 6 | Not Selected | Not Selected | |
| \$7,000 | \$6,777 | \$9,182 | 135.49 | Not Selected | Scenario 2 | Not Selected | Not Selected | |
| \$8,000 | \$7,063 | \$10,007 | 141.68 | Scenario 22 | Scenario 2 | Not Selected | Not Selected | |
| \$12,000 | \$11,999 | \$14,119 | 117.67 | Not Selected | Scenario 4 | Not Selected | Not Selected | |
| \$13,000 | \$12,888 | \$15,768 | 122.35 | Not Selected | Scenario 3 | Not Selected | Not Selected | |
| \$14,000 | \$13,174 | \$16,593 | 125.95 | Scenario 22 | Scenario 3 | Not Selected | Not Selected | |
| \$17,000 | \$16,781 | \$44,653 | 266.09 | Not Selected | Scenario 10 | Not Selected | Not Selected | |
| \$18,000 | \$17,067 | \$45,478 | 266.47 | Scenario 22 | Scenario 10 | Not Selected | Not Selected | |
| \$22,000 | \$20,880 | \$47,052 | 225.34 | Scenario 23 | Scenario 10 | Not Selected | Not Selected | |
| \$28,000 | \$27,172 | \$49,086 | 180.65 | Scenario 24 | Scenario 10 | Not Selected | Not Selected | |
| \$33,000 | \$31,924 | \$50,497 | 158.18 | Scenario 25 | Scenario 10 | Not Selected | Not Selected | |
| \$52,000 | \$51,332 | \$56,950 | 110.94 | Not Selected | Scenario 5 | Not Selected | Not Selected | |
| Summary | Best Rate of Retu 288.46% | irn | Maximum 78-57% | Savings | | | PLOT RESU | LTS |
| Budget Required | \$286 | | \$13,165,060 |) | | | SAVE RESU | LTS |
| Savings Obtained | \$825 | | \$10,344,405 | 5 | | | EXIT | |
| | | | | | | | | |

Implementation Project 5-5534



| INPU | T DATA | | R | ESULTS | | | | He |
|------------------|--------------------------|----------------------|-----------------------|--------------------|------------------------------|--------------------------------|--------------------|----|
| BUDGET OPTION | RESULTING EXPENDITURE | RESULTING SAVINGS | RATE OF RETURN (%) | FM 973 - Austin | SH78 from SH205 to FM6 | NE PARKWAY EL PASO DISTR | Houston FM 1488 | |
| \$12,236,000 | \$12,234,693 | \$10,050,854 | 82.15 | Scenario 23 | Scenario 17 | Scenario 15 | Scenario 33 | |
| \$12,242,000 | \$12,240,985 | \$10,052,888 | 82.12 | Scenario 24 | Scenario 17 | Scenario 15 | Scenario 33 | |
| \$12,247,000 | \$12,245,737 | \$10,054,299 | 82.10 | Scenario 25 | Scenario 17 | Scenario 15 | Scenario 33 | |
| \$12,394,000 | \$12,391,476 | \$10,114,565 | 81.63 | Scenario 22 | Scenario 17 | Scenario 10 | Scenario 33 | |
| \$12,397,000 | \$12,395,289 | \$10,116,139 | 81.61 | Scenario 23 | Scenario 17 | Scenario 10 | Scenario 33 | |
| \$12,403,000 | \$12,401,581 | \$10,118,173 | 81.59 | Scenario 24 | Scenario 17 | Scenario 10 | Scenario 33 | |
| \$12,408,000 | \$12,406,333 | \$10,119,584 | 81.57 | Scenario 25 | Scenario 17 | Scenario 10 | Scenario 33 | |
| \$12,541,000 | \$12,538,949 | \$10,182,649 | 81.21 | Scenario 22 | Scenario 17 | Scenario 21 | Scenario 33 | |
| \$12,544,000 | \$12,542,762 | \$10,184,223 | 81.20 | Scenario 23 | Scenario 17 | Scenario 21 | Scenario 33 | |
| \$12,550,000 | \$12,549,054 | \$10,186,257 | 81.17 | Scenario 24 | Scenario 17 | Scenario 21 | Scenario 33 | |
| \$12,555,000 | \$12,553,806 | \$10,187,668 | 81.15 | Scenario 25 | Scenario 17 | Scenario 21 | Scenario 33 | |
| \$13,143,000 | \$13,141,740 | \$10,337,943 | 78.66 | Scenario 26 | Scenario 17 | Scenario 21 | Scenario 33 | |
| \$13,166,000 | \$13,165,060 | \$10.344,405 | 78.57 | Scenario 27 | Scenario 17 | Scenario 21 | Scenario 33 | |
| | | | | | | | | |
| | | | | | | | | |
| ummary | Best Rate of Re | turn | Maximum | Savings | | | DI OT DESUIT | ~ |
| Rate of Return | 288.46% | | 78.57% | | | | FLOT RESUL | 5 |
| Budget Required | \$286 | | \$13,165.060 | D | | | SAVE RESULT | S |
| Savings Obtained | 4025 | | ¢10,244,400 | / | | | EVIT | |

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EROW Optimization

Savings Obtained

\$44,653

Texas Transportation Institute

| Help | | | | ESULTS | R | | T DATA | INPU |
|------|--------------------|--------------------------------|------------------------------|--------------------|-----------------------|----------------------|--------------------------|------------------|
| | Houston FM 1488 | NE PARKWAY EL PASO DISTR | SH78 from SH205 to FM6 | FM 973 - Austin | RATE OF RETURN (%) | RESULTING SAVINGS | RESULTING EXPENDITURE | BUDGET OPTION |
| | Scenario 32 | Not Selected | Scenario 16 | Scenario 25 | 67.94 | \$2,703,279 | \$3,978,986 | \$4,001,000 |
| | Scenario 32 | Not Selected | Scenario 17 | Not Selected | 68.67 | \$2,757,096 | \$4,015,174 | \$4,021,000 |
| | Scenario 32 | Not Selected | Scenario 17 | Scenario 25 | 68.55 | \$2,762,940 | \$4,030,317 | \$4,041,000 |
| | Scenario 32 | Scenario 15 | Scenario 17 | Not Selected | 67.87 | \$2,825,180 | \$4,162,647 | \$4,181,000 |
| | Scenario 32 | Scenario 15 | Scenario 17 | Scenario 25 | 67.76 | \$2,831,024 | \$4,177,790 | \$4,201,000 |
| | Scenario 32 | Scenario 10 | Scenario 17 | Not Selected | 66.86 | \$2,890,465 | \$4,323,243 | \$4,341,000 |
| | Scenario 32 | Scenario 10 | Scenario 17 | Scenario 25 | 66.76 | \$2,896,309 | \$4,338,386 | \$4,361,000 |
| | Scenario 32 | Scenario 21 | Scenario 17 | Not Selected | 66.18 | \$2,958,549 | \$4,470,716 | \$4,481,000 |
| | Scenario 32 | Scenario 21 | Scenario 17 | Scenario 25 | 66.08 | \$2,964,393 | \$4,485,859 | \$4,501,000 |
| | Scenario 32 | Scenario 21 | Scenario 17 | Scenario 26 | 61.39 | \$3,114,668 | \$5,073,793 | \$5,101,000 |
| | Scenario 32 | Scenario 21 | Scenario 17 | Scenario 27 | 61.23 | \$3,121,130 | \$5,097,113 | \$5,121,000 |
| | Scenario 20 | Not Selected | Not Selected | Not Selected | 89.53 | \$7,223,204 | \$8,067,948 | \$8,081,000 |
| | Scenario 20 | Not Selected | Scenario 10 | Not Selected | 89.90 | \$7,267,857 | \$8,084,729 | \$8,101,000 |
| | Scenario 20 | Not Selected | Scenario 10 | Scenario 25 | 89.80 | \$7,273,701 | \$8,099,872 | \$8,121,000 |
| | Scenario 20 | Not Selected | Scenario 5 | Scenario 25 | 89.57 | \$7,285,998 | \$8,134,423 | \$8,141,000 |
| | | | | Savings | Maximum | | Best Rate of Retu | imary |
| .1S | PLOT RESU | | | - | 78 57% | | 266.09% | ate of Return |

Implementation Project 5-5534

\$10,344,405



EXIT

X

Review of Data Analysis





Comparison of TAMSIM Input from the Four Districts - Project Information

| | | | | | | | | | | | Additional |
|--------------------|-------|----|----|----|----|----|----|----|-----|---|---|
| | | | | | | | | | | | Cost Increase Due to Speculation %/year |
| | | | | | | | | | | | 5 |
| | | | | | | | | | | | 15 |
| | | | | | | | | | | | 0 |
| Houston: FM1488 | Metro | 28 | 18 | 24 | 36 | 48 | 60 | 72 | 108 | 9 | 150/15 |





Comparison of TAMSIM Input from the Four Districts - Parcel Information

| Project Description | Total Number of Parcels | Number of Parcels with Likelihood of Improve- ment | Cost Multiplier for Improve- ments | Number of Parcels with Possible Condem- nations | Multiplier for Duration of Condem- nation | Multiplier of Cost for Condem- nation | Mean Duration to Posses- sion from ROW Release | Average Parcel Cost, \$1000s | Median Parcel Cost, \$1000s | Max Parcel Cost, \$1000s |
|---------------------------|----------------------------------|---|--|--|---|---|---|---------------------------------------|--------------------------------------|-----------------------------------|
| Austin: FM 973 | 20 | 0 | 1 | 16 | 1.485 | 1.869 | 14 ~ 29 | 157 | 28 | 1,087 |
| Dallas: SH78 | 10 | 6 | 2 ~ 6 | 10 | 1.5 | 1.5 | 12 | 24 | 10 | 61 |
| El Paso: NE Parkway | 19 | 2 | 2.5 | 11 | 1.661 | 1.3 | 4 ~ 18 | 455 | 115 | 2,756 |
| Houston: FM1488 | 28 | 26 | 2 ~ 2.5 | 28 | 1.25 | 1.3 | 15 ~ 18 | 565 | 154 | 6,750 |

Texas Transportation Institute



Summary

| District | Number of Parcels | Mean Cost Without Early Acquisition (1,000s) | Avg Cost per Parcel (1000s) |
|----------|----------------------|--|--------------------------------|
| Austin | 20 | \$5,098 | \$254.88 |
| Dallas | 10 | \$788 | \$78.78 |
| El Paso | 19 | \$9,110 | \$479.49 |
| Houston | 28 | \$32,177 | \$1,149.18 |
| | | | |
| | | Average Cost per Parcel | |

Dollars (1,000s)





Discussion on Tool Applications and Potential Benefits to Users in Districts





Final Questions?

Adjourn



