

# Extracting Project Quantities with InRoads



## Presentation made by:

Michael Jepsen  
Road & Railway department  
Carl Bro Group Denmark

The presentation is based on a presentation from the InRoads User Conference in Denver 2005 of Edmundo Herrera, Bentley

---

# InRoads Quantity Solution

Two Major Components:

## InRoads Quantity Extractor

- Computes quantities from DTM data
- Exports those quantities to Quantity Manager

## Quantity Manager

- Manages quantities (reporting, estimating, etc.)
- Standalone
- Database application

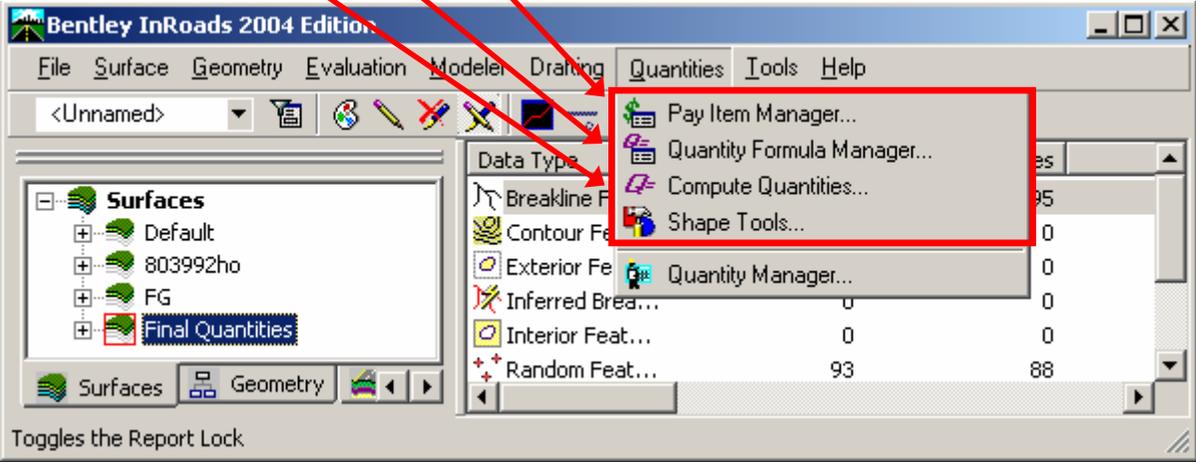
# InRoads Quantity Extractor

Pay Item Database

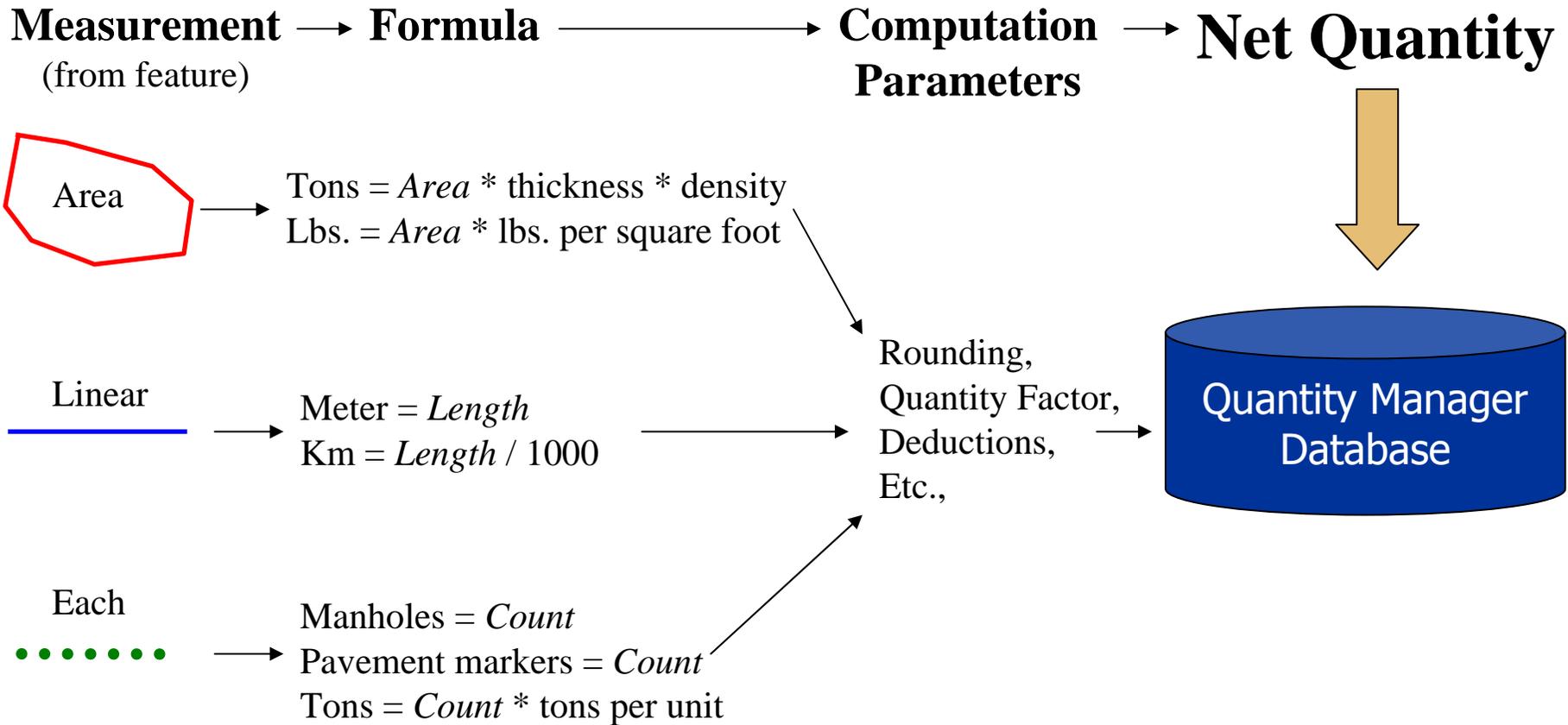
Pay Item Manager

Quantity Formula Manager

Compute Quantities



# InRoads Quantity Extractor



NCUC, Stockholm 1.-2.November 2005

Michael Jepsen

© 2005, Bentley - side 4

# Pay Item Manager

Manages Pay Item databases

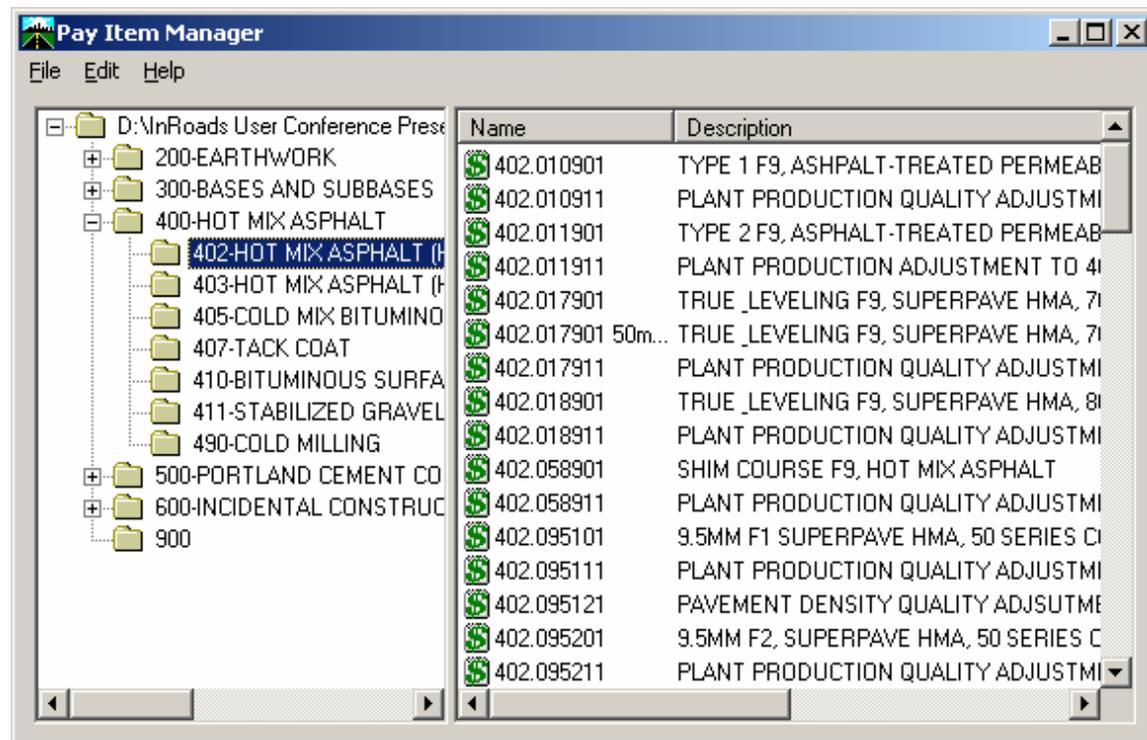
- Open
- Create
- Close

Manages Pay Items

- Organizes pay items by category
- Create
- Edit
- Copy
- Delete

Windows Look and Feel

- Drag and drop
- Right click
- Popup menus



---

# Pay Item

We know what it is, but what is it in InRoads?

- Assigned to features
  - Feature style
  - Feature properties
- Defines computation of pay items
  - Formula, rounding, deductions, etc.
- Stored in the InRoads Pay Item database

# Pay Item

## Pay Item Name

- Assigned to Style or Feature

## Pay Item Code

- Locked to name by default
- Sent to QM database
- Appears on reports

## Unit Name

- TN, SY, FT, etc.
- Sent to QM database
- Appears on reports

## Formula

- From Quantity Formulas
- Assign variable substitutions

**Edit Pay Item**

Pay Item Name: 402.256901 65mm

Pay Item Code: 402.256901

Description: 25MM F9 SUPERPAVE HMA, 60 SERIE

Unit Name: MT

Quantity Calculation

Formula: Metric Tons

Variables:

Name	Value
mm	65.0000
UnitWgt	2.4040

Value: 0.0000

Deduct from Pay Item

Pay Items:

Pay Item	Deduction
----------	-----------

Value: 0.0000

Measurement

Mode:  Planarized  Slope

Apply Quantity Factor: 0.0000

Apply Rounding Factor: 0.1000

Round Up  Round Down

# Pay Item

## Deductions

- Corrects for coincident items
- Ex. Inlets / Curb & Gutter
- Enter pay items to be deducted

## Measurement

- Planar
- Slope

## Quantity Factor

- Applied to computed value
- Ex. 1 Margin of error
- Ex. 2 Paint stripe/skip

## Rounding Factor

- Round to any decimal place
- Round up or down

**Edit Pay Item**

Pay Item Name: 402.256901 65mm  
Pay Item Code: 402.256901  
Description: 25MM F9 SUPERPAVE HMA, 60 SERIE  
Unit Name: MT

Quantity Calculation  
Formula: Metric Tons  
Variables:  

Name	Value
mm	65.0000
UnitWgt	2.4040

  
Value: 0.0000

Deduct from Pay Item  
Pay Items:  

Pay Item	Deduction
----------	-----------

  
Value: 0.0000

Measurement  
Mode:  Planarized  Slope  
 Apply Quantity Factor: 0.0000  
 Apply Rounding Factor: 0.1000  
 Round Up  Round Down

---

# Quantity Formula

What is it?

- Converts the geometric measurement of a feature to a quantity.

Examples

- Metric Tons = {AREA} x thickness x weight
- Liters = {LENGTH} x width x liters per square meter
- Cubic Meters = {EACH} x cubic meters per unit

Associated with features via pay items

Stored in the InRoads Pay Item database

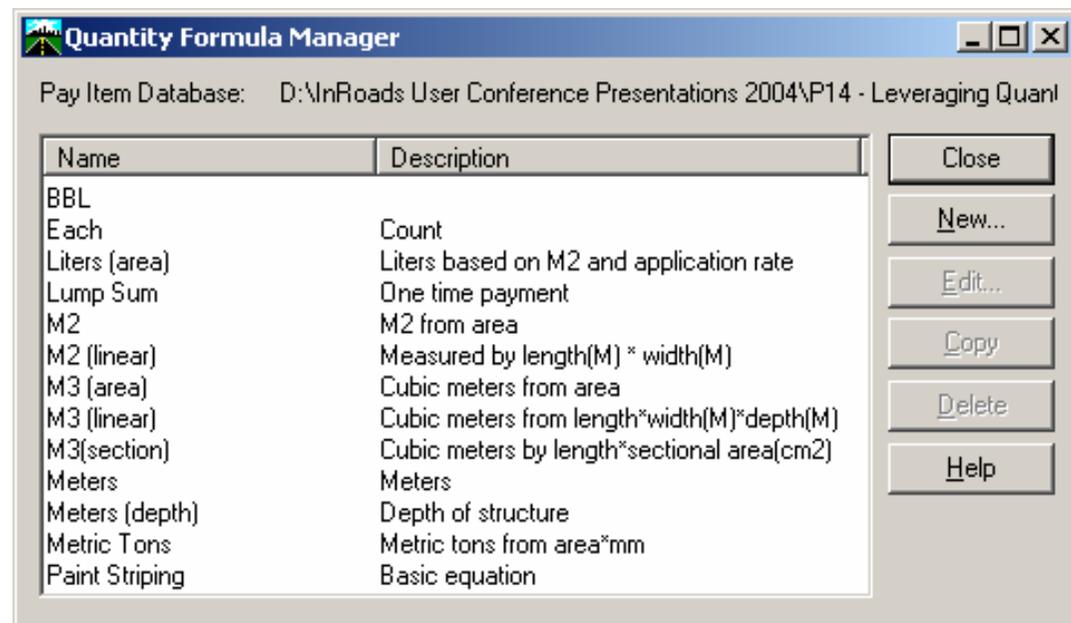
# Quantity Formula Manager

## Manages Formulas

- Create
- Edit
- Delete

Default set delivered

Customizable



# Quantity Formula

## Measurement Basis

- Each – count feature or points
- Linear – length of feature
- Area – area of closed feature

## Formula

- Measurement Tag
  - {EACH}, {LINEAR}, {AREA}
- Unlimited Variables
- Unlimited Constants
- Math operators

## Test Values

- Variable substitutions for testing formula
- Tag and variables are parsed out automatically

**Edit Quantity Formula**

Name:

Description:

Measurement Basis:

Formula:

Result:

Test Values:

Name	Value
{AREA}	1.0000
mm	1000.00...
UnitWgt	2.4040

Value:

---

# Associating Pay Items with InRoads Features

## Two Methods

1. Assign pay items to feature styles
2. Assign pay items to features

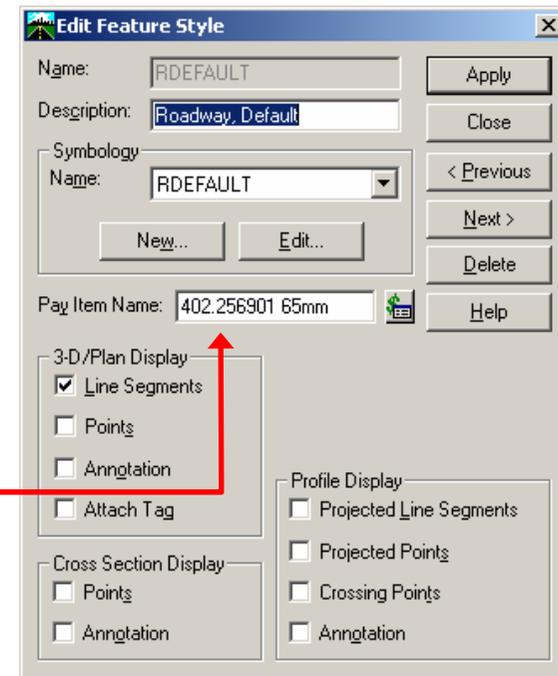
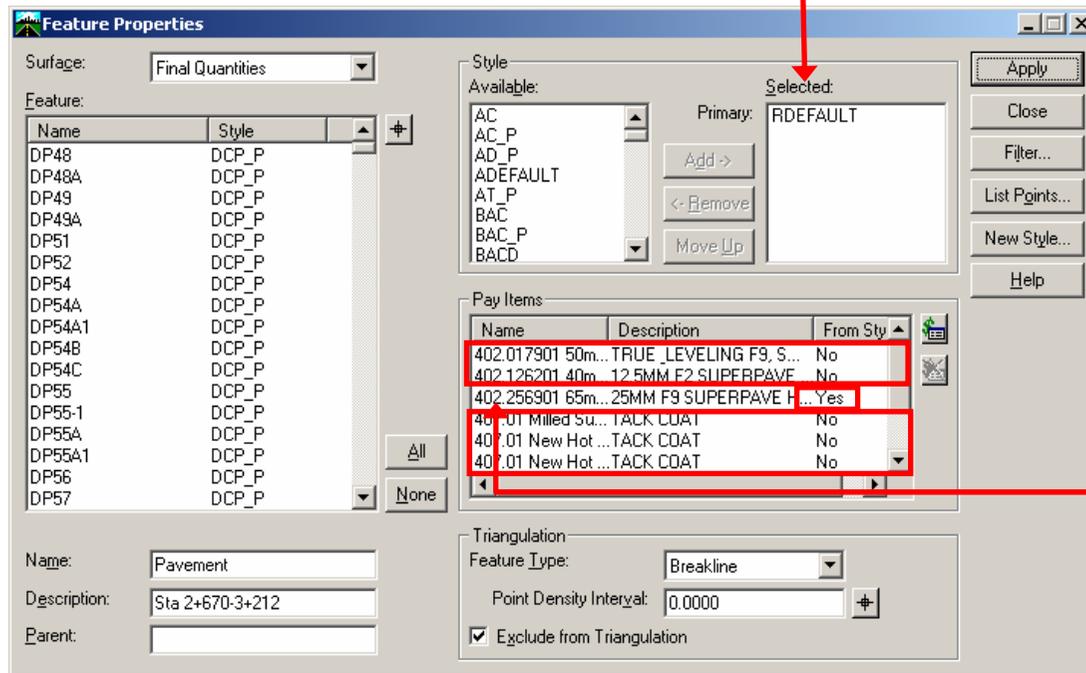
## Multiple pay items per feature

- Assign multiple pay items to the feature
- Feature styles can contain only one pay item

# Associating Pay Items with InRoads Features

## Feature Properties

## Feature Style



# Compute Quantities

## Control Alignment

- Controls the range
- Used to compute station/offset locations

## Mode

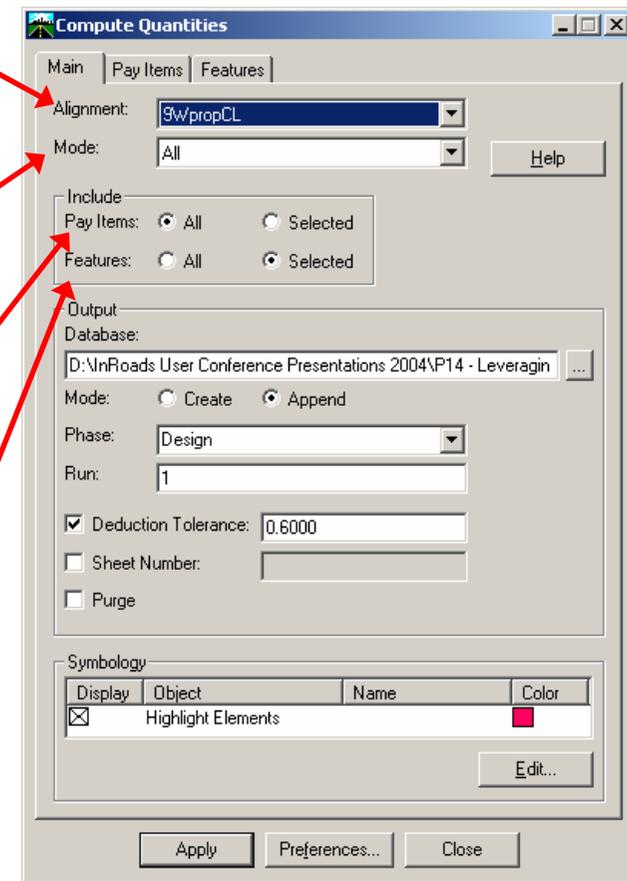
- All – everything within the station range.
- Fence - inside, clip, void, etc.

## Include Pay Items

- All – process all pay items in the pay item manager
- Selected – ignore pay items not selected on the pay items tab

## Include Features

- All – process all features in all loaded DTMs
- Selected – ignore features not selected on the features tab



# Compute Quantities

## Output

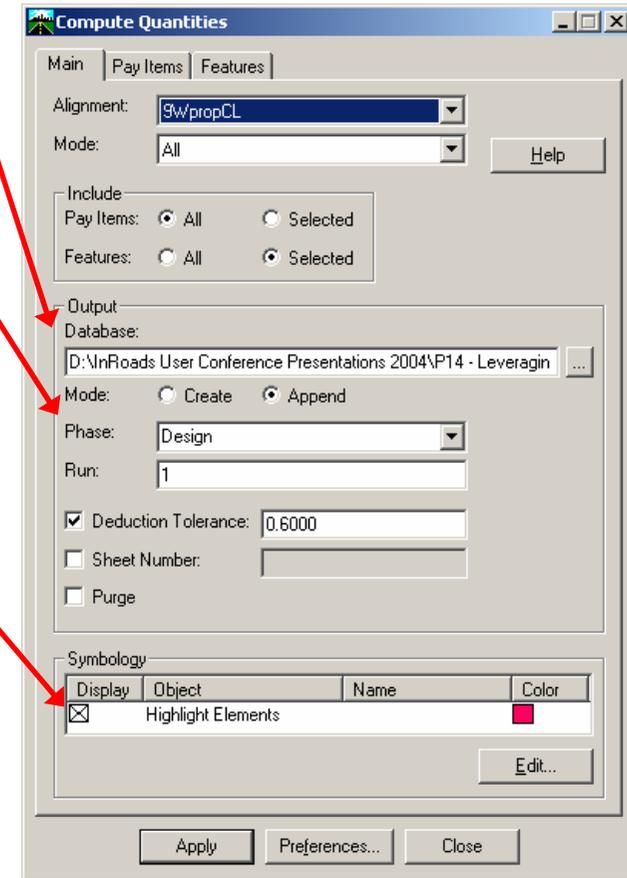
- Quantities Database
- Create new, or append to existing

## Phase

- Preliminary
- Design
- Final
- Other – editable combo box accepts key-ins

## Highlight Elements

- Features are displayed with the selected symbology as they are quantified.



---

# Quantity Manager

Database application for managing quantities

Plan quantities

Earthwork

Non-graphic quantities

Funding Partitions

XML based, customized reports

Cost estimating

Cost comparisons

# Quantity Manager Interface

## Pay Items

- Unit Name
- Unit Cost

## Quantities

- Quantity
- Measurement basis
- Station location
- Etc.

## Elements

- Begin/End X,Y
- Station Location
- Etc.

The screenshot shows the Quantity Manager interface with a tree view on the left and a table on the right. Red arrows point from the text on the left to specific elements in the interface.

Category	Payitem	Phase	Chain	Net Value	Measure...	Remarks	Descripti...
root\200-EA...	203.07	Design	9\WpropCL@...	16.9	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	10.6	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	14.3	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	10.6	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	18.1	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	43.5	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	12.4	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	11.2	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	10.6	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	14.7	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	11.4	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	10.6	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	10.6	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	10.8	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	11.3	Linear		
root\200-EA...	203.07	Design	9\WpropCL@...	10.8	Linear		

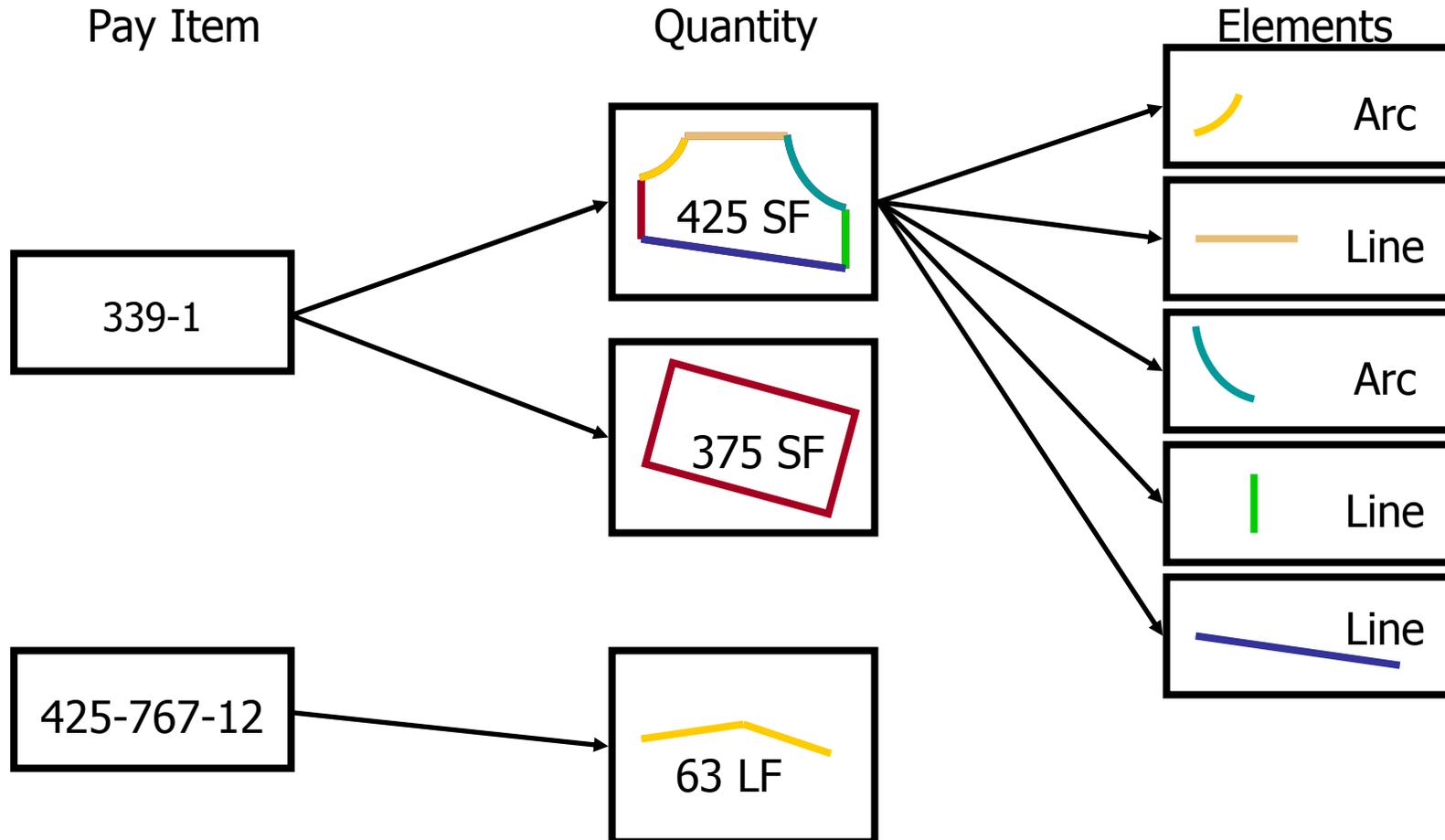
  

Type	Name	Radius	Delta	Length	Direction	Native Id	Document
Line	DR48			2.054		0\082E846E...	Final Quantit...

NCUC, Stockholm 1.-2.November 2005  
Michael Jepsen

© 2005, Bentley - side 17

# Database Table Relationships



NCUC, Stockholm 1.-2.November 2005  
Michael Jepsen

© 2005, Bentley - side 18

# Quantity Contents

## “Itemized” quantity list

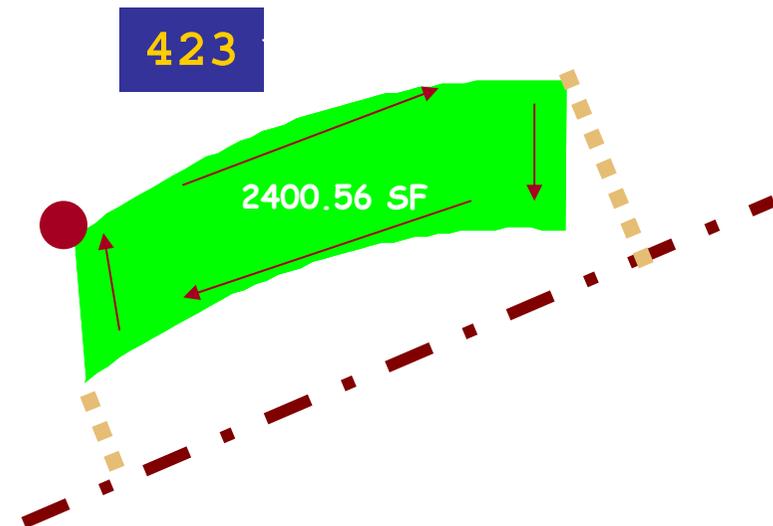
- Measurement
- Parameters
- Quantity (unrounded & rounded)

## Element location information

- Begin / End x, y, station, offset
- Minimum / Maximum x, y, station, offset

## Feature information

- Surface Name
- Feature Name



---

# How to get data into Quantity Manager

## Run InRoads quantity extractor

- Plan view quantities
- Clearing & grubbing, asphalt, guard rail, seeding, etc

## Enter manually through the interface

- Mobilization, Human Resources, Equipment, etc

## Import from CSV

- Pay item data
- Quantity data

# Cost Estimating

## Unit Cost

The screenshot shows the 'Quantity Manager' application window. The 'Payitem Table' tab is active, displaying a list of construction items with their respective units, unit costs, and total costs. A red box highlights the entire table, and a red arrow points from the 'Unit Cost' column header to the 'Unit Cost' column data.

Payitem	Description	Unit	Unit Cost	Total Cost
203.07	SELECT GRANULAR FILL	CM	26.75	33121.85
206.02	TRENCH AND CULVERT EXCAVATION	CM	18.28	54004.6
08304.11	SUBBASE COURSE, TYPE 1 - Region 8	CM	152	713184.0
402.017901	TRUE & LEVELING F9, SUPERPAVE HMA, 70...	MT	48.13	119540.48
402.126201	12.5MM F2 SUPERPAVE HMA, 60 SERIES C...	MT	40.63	133948.98
402.256901	25MM F9 SUPERPAVE HMA, 60 SERIES CO...	MT	43	219730.0
402.376901	37.5MM F9 SUPERPAVE HMA, 60 SERIES C...	MT	47.71	273363.99
407.01	TACK COAT	L	0.46	7900.95
490.1	PRODUCTION COLD MILLING BITUMINOUS C...	SQM	0.56	10703.1
603.9812	SMOOTH INTERIOR CORRUGATED POLYET...	M	78.48	1302.44
603.9815	SMOOTH INTERIOR CORRUGATED POLYET...	M	60.73	17490.24
603.9818	SMOOTH INTERIOR CORRUGATED POLYET...	M	63.74	9357.03
603.9824	SMOOTH INTERIOR CORRUGATED POLYET...	M	117.2	18224.6
603.9830	SMOOTH INTERIOR CORRUGATED POLYET...	M	117.83	35042.64
603.9836	SMOOTH INTERIOR CORRUGATED POLYET...	M	86	7843.2

NCUC, Stockholm 1.-2.November 2005  
 Michael Jepsen

© 2005, Bentley - side 21

---

# Funding Partitions

## Multiple payers

- Federal
- State
- County
- City

## Apply funding rules to quantities

- By selection
- By station range

# Funding Rules

Station Range

Contribution %

Payers

Funding	Payer	Description	%
After Intersection	FHWA	Federal Highway Administration	30
Before Intersection	NYSDOT	New York State Department of Tran...	70
Intersection	DEFAULT PAYER		0
DEFAULT FUNDING			

Station Range

Limit Funding Rule within Station Range

Chain: 9WpropCL (9WpropCL)

Begin Station: 3805.0 Region: 1

End Station: 4550.0 Region: 1

Update

# Funding Review

Cost per rule

Cost per payer

Quantity Manager - D:\InRoads User Conference Presentations 2004\PI4 - Leveraging Quantities\Rte9Project\Demo\803992Q.mdb

Project Edit View Insert Tools Help

Phase: ALL PHASES

Payitem	Description	Unit	Unit Cost	Total Cost	FHWA	NYSDOT	Before Intersection	Intersection	After Intersection
203.07	SELECT GR...	CM	26.75	33121.85	905.7	2,716.4	1,222.242	1,206.202	1,193.656
206.02	TRENCH AN...	CM	18.28	54004.6	2,152.21	6,427.89	2,919.667	2,812.132	2,848.302
08304.11	SUBBASE C...	CM	152	713184.0	1,558.159	4,487.411	2,993.68	1,703.414	1,348.476
402.017901	TRUE & LEV...	MT	48.13	119540.48	1,862.775	5,588.325	2,483.7	2,483.7	2,483.7
402.126201	12.5MM F2 ...	MT	40.63	133948.98	1,847.934	5,487.066	2,759.491	2,350.439	2,225.071
402.256901	25MM F9 SU...	MT	43	219730.0	2,817.4	8,360	4,236.857	3,572.135	3,368.408
402.376901	37.5MM F9 ...	MT	47.71	273363.99	1,564.429	4,445.071	3,379.03	1,589.471	1,040.999
407.01	TACK COAT	L	0.46	7900.95	10,543.455	31,417.963	15,164.486	13,633.134	13,163.798
490.1	PRODUCTIO...	SQM	0.56	10703.1	14,334.503	43,003.51	19,112.671	19,112.671	19,112.671
603.9812	SMOOTH IN...	M	78.46	1302.44	12.46	37.35	16.6	16.6	16.6
603.9815	SMOOTH IN...	M	60.73	17490.24	216	648	288	288	288
603.9818	SMOOTH IN...	M	63.74	9357.03	110.1	330.3	146.8	146.8	146.8
603.9824	SMOOTH IN...	M	117.2	18224.6	116.625	349.875	155.5	155.5	155.5

Payitem	Description	Unit	Unit Cost	Total Cost	FHWA	NYSDOT	Before Intersection	Intersection	After Intersection
203.07	SELECT GR...	CM	26.75	33121.85	905.7	2,716.4	1,222.242	1,206.202	1,193.656
206.02	TRENCH AN...	CM	18.28	54004.6	2,152.21	6,427.89	2,919.667	2,812.132	2,848.302
08304.11	SUBBASE C...	CM	152	713184.0	1,558.159	4,487.411	2,993.68	1,703.414	1,348.476
402.017901	TRUE & LEV...	MT	48.13	119540.48	1,862.775	5,588.325	2,483.7	2,483.7	2,483.7
402.126201	12.5MM F2 ...	MT	40.63	133948.98	1,847.934	5,487.066	2,759.491	2,350.439	2,225.071
402.256901	25MM F9 SU...	MT	43	219730.0	2,817.4	8,360	4,236.857	3,572.135	3,368.408
402.376901	37.5MM F9 ...	MT	47.71	273363.99	1,564.429	4,445.071	3,379.03	1,589.471	1,040.999
407.01	TACK COAT	L	0.46	7900.95	10,543.455	31,417.963	15,164.486	13,633.134	13,163.798
490.1	PRODUCTIO...	SQM	0.56	10703.1	14,334.503	43,003.51	19,112.671	19,112.671	19,112.671
603.9812	SMOOTH IN...	M	78.46	1302.44	12.46	37.35	16.6	16.6	16.6
603.9815	SMOOTH IN...	M	60.73	17490.24	216	648	288	288	288
603.9818	SMOOTH IN...	M	63.74	9357.03	110.1	330.3	146.8	146.8	146.8
603.9824	SMOOTH IN...	M	117.2	18224.6	116.625	349.875	155.5	155.5	155.5
603.9830	SMOOTH IN...	M	117.83	35042.64	198.834	595.766	280.549	263.637	250.414

NCUC, Stockholm 1.-2.November 2005

Michael Jepsen

© 2005, Bentley - side 24

---

# Custom Reports

User defined Report styles offer robust reporting capability  
Quantity data is streamed in XML format through style sheets  
The user defines the following:

- Granularity of data
  - By pay item
  - By quantity
  - By funding rules
  - Etc.
- Output format
  - PDF (Adobe)
  - HTML (web page)
  - CSV (comma separated values)
  - TXT
- XSL file used to process the report

# Custom Reports

DEPARTMENT OF TRANSPORTATION  
CURB AND/OR GUTTER COMPUTATION

STATION TO STATION	SIDE	PAY ITEM DESCRIPTION COMBINATION CURB & GUTTER, TYPE C		DESIGN ORIGINAL		NET	GROSS
		GROSS LENGTH (LIN FT)	DEDUCTIONS	TYPE	LENGTH		
50+85 - 15+13.79 (Centerline)	LT	1531			60		
50+85 - 15+87.27 (Centerline)	RT	1543			142		
14+54.00 - 15+07.47 (Centerline)	LT	129			0		
14+76.95 - 15+85.18 (Centerline)	LT	214			0		
15+88.18 - 32+00.77 (Centerline)	LT	1521			112		
15+87.27 - 16+80.25 (Centerline)	LT	484			0		
18+32.25 - 32+00.77 (Centerline)	RT	1611			74		
16+33.02 - 17+07.80 (Centerline)	RT	459			0		

HTML

Name	Description	Unit	Unit Cost	Total Quantity	Total Cost
201A000	CLEARING & GRUBBING (APPROXIMATELY ____ACRES)	LUMP SUM	1500.0	5.71	8568.79
206C009	REMOVING BITUMINOUS PAVEMENT	SQ YD	5.0	11011.00	55055.00
623C000	COMBINATION CURB & GUTTER, TYPE C	LIN FT	14.0	7204.00	100856.00
530A001	18" ROADWAY PIPE (CLASS 3 R.C.)	LIN FT	50.0	2591.00	129550.00
530A002	24" ROADWAY PIPE (CLASS 3 R.C.)	LIN FT	65.0	83.00	5395.00
530A003	30" ROADWAY PIPE (CLASS 3 R.C.)	LIN FT	90.0	330.00	29700.00
		CU YD	100.0	226.00	22600.00
		EACH	500.0	8.00	4000.00
		EACH	650.0	2.00	1300.00
		EACH	800.0	1.00	800.00
		EACH	2800.0	20.00	56000.00
		EACH	3500.0	4.00	14000.00
		EACH	2000.0	3.00	6000.00

PDF

Microsoft Excel - Quantities.csv

	A	C	G	K	L	M	N
1	Chain	Minimum Station	Maximum Station	201A000	206C009	623C000	530A001
2	Centerline	50.84	1534.35	1.24			
3	Centerline	50.85	1684.52	1.55			
4	Centerline	1475.44	3200.77	1.47			
5	Centerline	1619.27	3200.77	1.46			
6	Centerline	49.64	3200.77		11011		
7	Centerline	50.85	1513.8			1471	
8	Centerline	50.85	1587.27			1401	
9	Centerline	1454	1507.48			129	

Excel

NCUC, Stockholm 1.-2.November 2005  
Michael Jepsen

© 2005, Bentley - side 26