



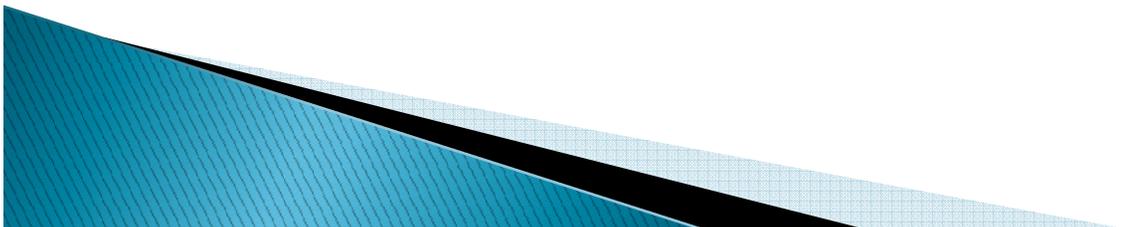
MnDOT Project Management  
Office Presents:

# WBS – Work Breakdown Structure

Presenter: Jonathan McNatty, PSP  
Senior Schedule Consultant  
DRMcNatty & Associates, Inc.

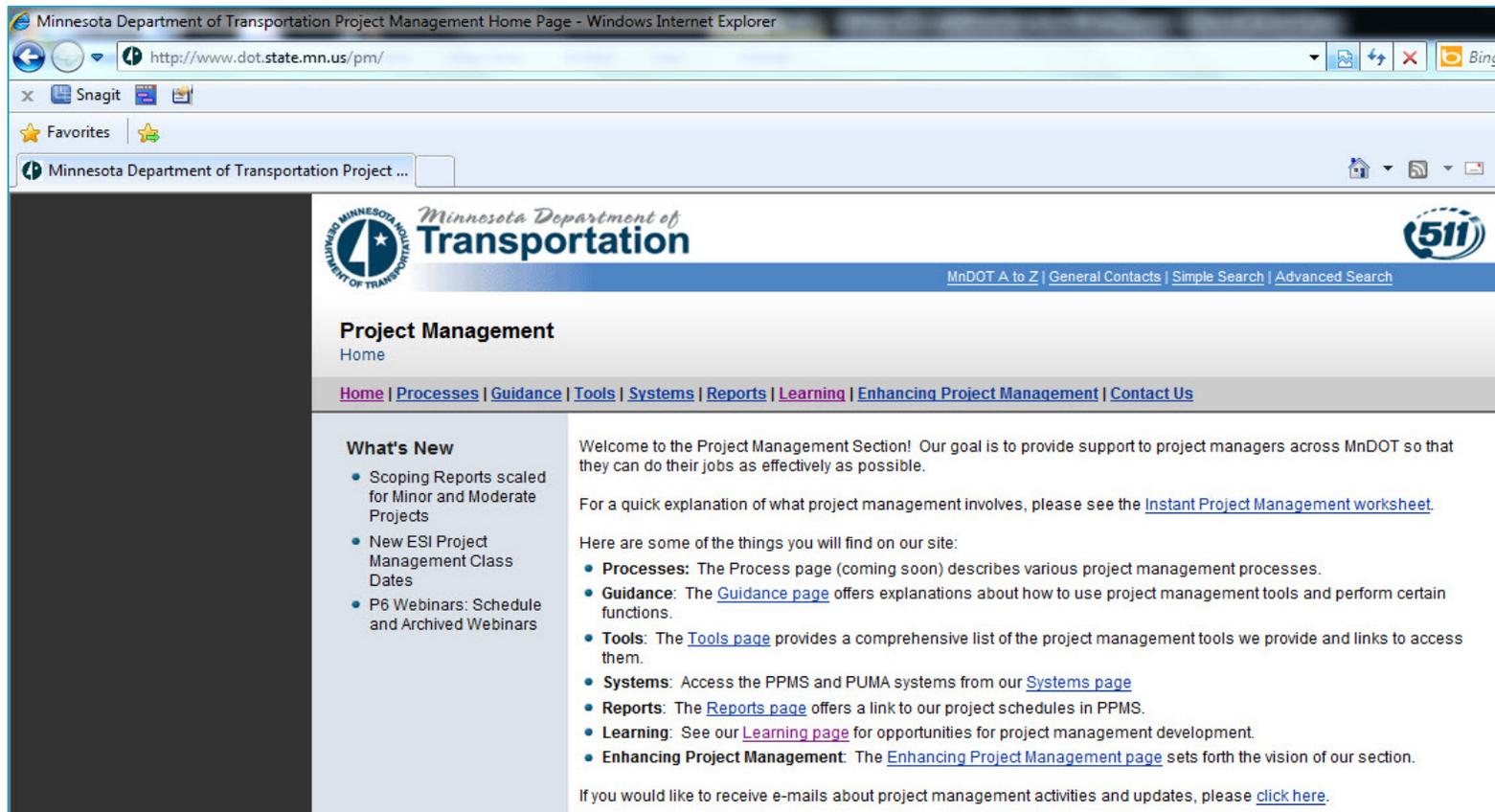
# Housekeeping Items

- ❖ Lines will be muted during the webinar
- ❖ Questions can be submitted thru the GoToWebinar Questions box on right of your screen
- ❖ Webinar slides available in pdf on MnDOT website within 5 days
- ❖ Questions will be posted on the MnDOT website with answers within in 5 days
- ❖ Webinar is being recorded and will be available on the MnDOT website within 5 days
- ❖ <http://www.dot.state.mn.us/pm/>



# MnDOT Webinars

❖ <http://www.dot.state.mn.us/pm/>



The screenshot shows a Windows Internet Explorer browser window displaying the Minnesota Department of Transportation Project Management Home Page. The address bar shows the URL <http://www.dot.state.mn.us/pm/>. The page features the MnDOT logo and navigation links for "MnDOT A to Z", "General Contacts", "Simple Search", and "Advanced Search". The main content area is titled "Project Management Home" and includes a "What's New" section with three bullet points: "Scoping Reports scaled for Minor and Moderate Projects", "New ESI Project Management Class Dates", and "P6 Webinars: Schedule and Archived Webinars". A welcome message follows, stating the goal is to provide support to project managers. Below this, there is a link to an "Instant Project Management worksheet" and a list of resources: "Processes", "Guidance", "Tools", "Systems", "Reports", "Learning", and "Enhancing Project Management". Each resource is accompanied by a brief description. At the bottom, there is a link to receive e-mails about project management activities and updates.

Minnesota Department of Transportation Project Management Home Page - Windows Internet Explorer

<http://www.dot.state.mn.us/pm/>

Minnesota Department of Transportation

MnDOT A to Z | [General Contacts](#) | [Simple Search](#) | [Advanced Search](#)

## Project Management

Home

[Home](#) | [Processes](#) | [Guidance](#) | [Tools](#) | [Systems](#) | [Reports](#) | [Learning](#) | [Enhancing Project Management](#) | [Contact Us](#)

### What's New

- Scoping Reports scaled for Minor and Moderate Projects
- New ESI Project Management Class Dates
- P6 Webinars: Schedule and Archived Webinars

Welcome to the Project Management Section! Our goal is to provide support to project managers across MnDOT so that they can do their jobs as effectively as possible.

For a quick explanation of what project management involves, please see the [Instant Project Management worksheet](#).

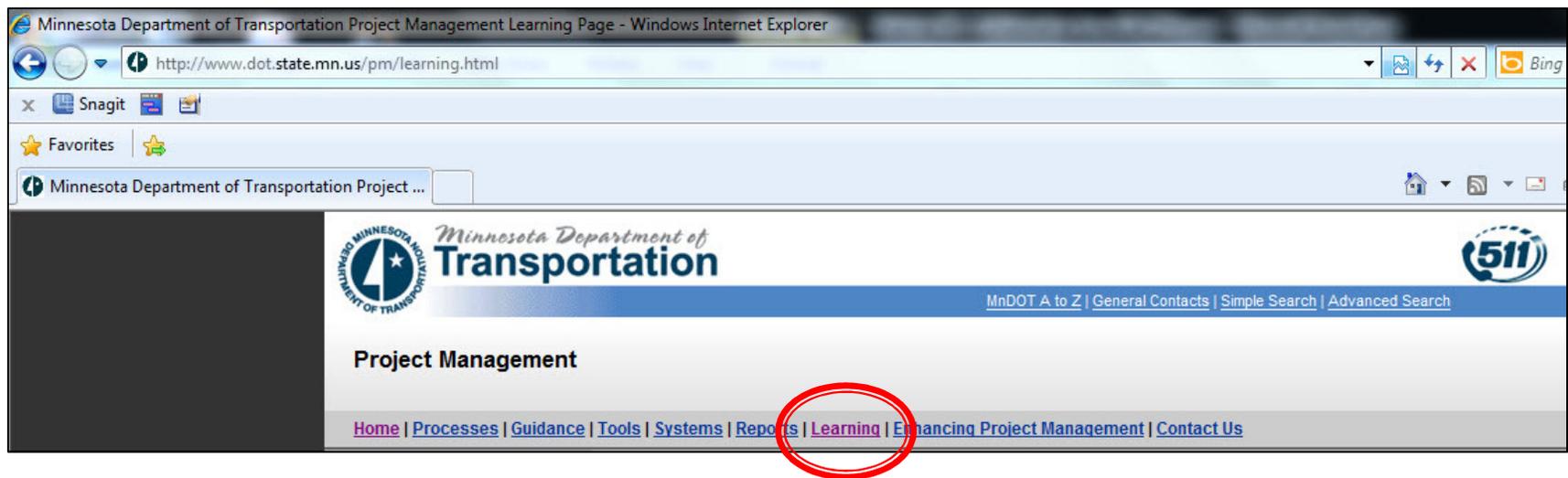
Here are some of the things you will find on our site:

- **Processes:** The Process page (coming soon) describes various project management processes.
- **Guidance:** The [Guidance page](#) offers explanations about how to use project management tools and perform certain functions.
- **Tools:** The [Tools page](#) provides a comprehensive list of the project management tools we provide and links to access them.
- **Systems:** Access the PPMS and PUMA systems from our [Systems page](#)
- **Reports:** The [Reports page](#) offers a link to our project schedules in PPMS.
- **Learning:** See our [Learning page](#) for opportunities for project management development.
- **Enhancing Project Management:** The [Enhancing Project Management page](#) sets forth the vision of our section.

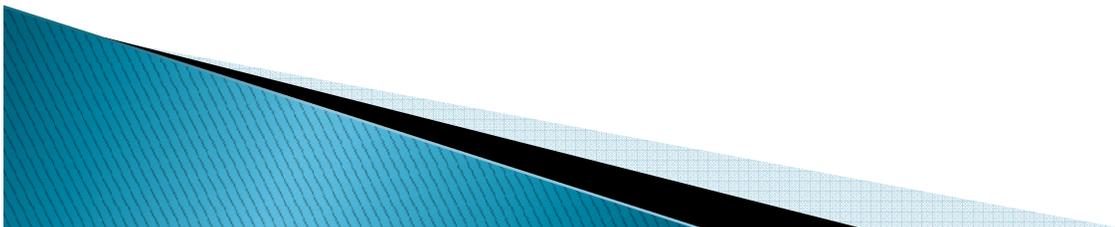
If you would like to receive e-mails about project management activities and updates, please [click here](#).

# MnDOT Webinars

❖ <http://www.dot.state.mn.us/pm/learning.html>



❖ Click on the “Learning” link



# MnDOT Webinars

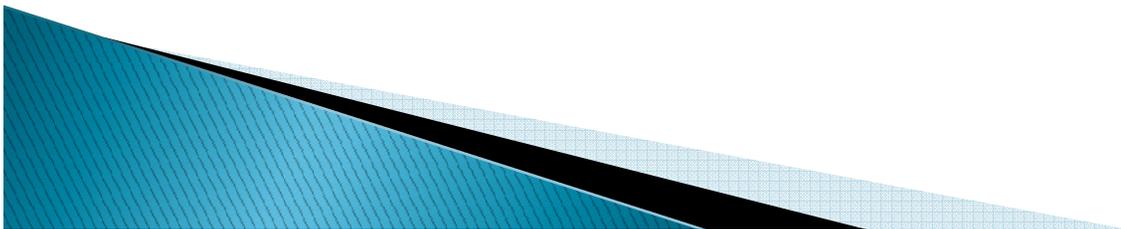
**Primavera P6 Webinars:** Each webinar will start at 1:00 p.m. and last 1/2 hour. Click the links below to register for a session. After each webinar, a recording will be made available from this page.

To request ASL or a foreign language interpreter or other reasonable accommodations for the live webinars, call Janet Miller at [651-336-4720](tel:651-336-4720) or [1-800-657-3774](tel:1-800-657-3774) (Greater Minnesota). You may send an email to [janet.rae.miller@state.mn.us](mailto:janet.rae.miller@state.mn.us) (please request at least one week in advance).

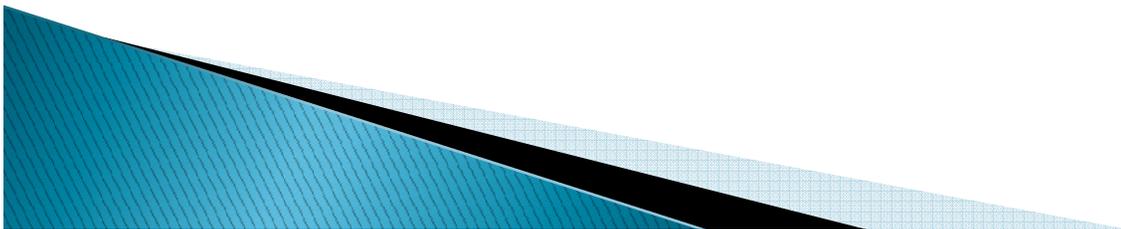
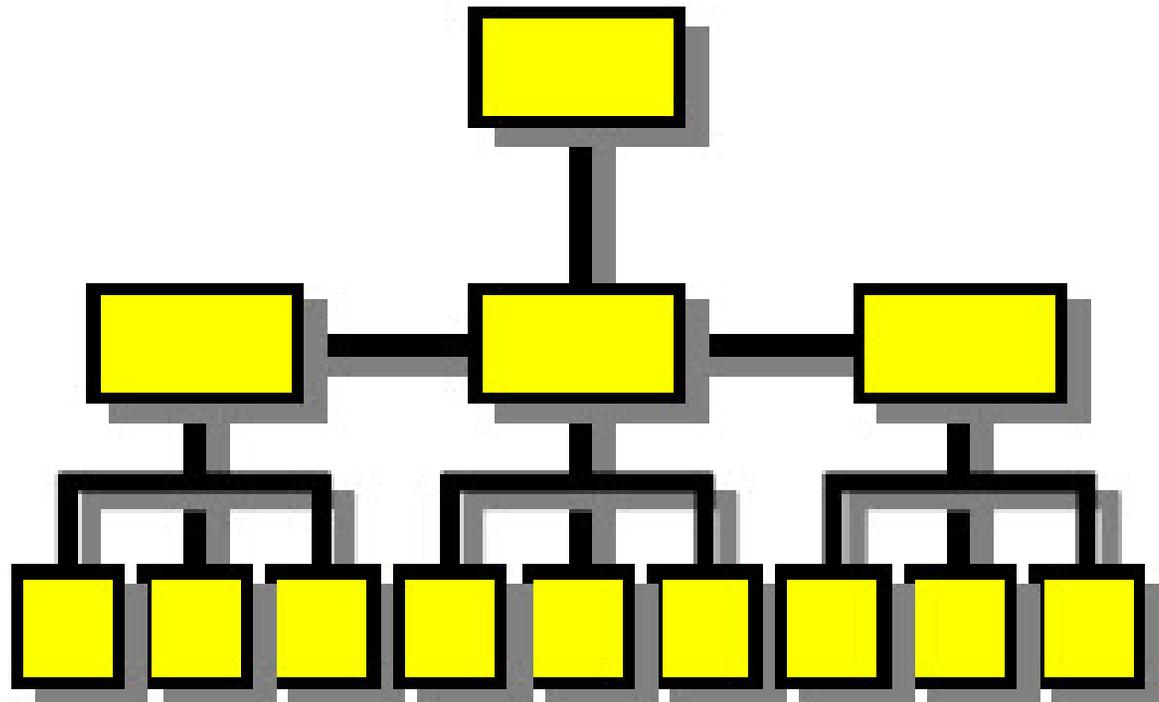
<b>The Future of MnDOT Project Controls</b>	March 13, 2013	
• <a href="#">View this Presentation</a> (13:51, WMV 17 MB)		
• <a href="#">View Slides</a> (PDF 2MB)		
<b>Primavera P6 in the Project Management Process</b>	March 20, 2013	
• <a href="#">View this Presentation</a> (28:39, WMV 40 MB)		
• <a href="#">View Slides</a> (PDF 8MB)		
• <a href="#">View Q&amp;A</a> (PDF 17KB)		
• <a href="#">View Script</a> (Word 25KB)		
<b>Collaborative Scheduling using the CPM Method</b>	March 27, 2013	
• <a href="#">View this Presentation</a> (32:57, WMV 34MB)		
• <a href="#">View Slides</a> (PDF 15MB)		
<b>Work Breakdown Structures</b>	April 3, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Scheduling Float</b>	April 10, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Schedule Baselines</b>	April 17, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Schedule Updates</b>	April 24, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Project Reporting</b>	May 1, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Impact Schedules</b>	May 8, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>MnDOT use of Calendars in Primavera P6</b>	May 15, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Roles and Resource Management</b>	May 22, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Risk Management</b>	May 29, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Views and Layouts for Program Management</b>	June 5, 2013	<a href="#">Reserve your Webinar seat now</a>
<b>Dashboards and Reporting for Program Management</b>	June 12, 2013	<a href="#">Reserve your Webinar seat now</a>

# Introduction to Webinar

A well-developed WBS is a critical aspect to managing the project schedule. Learn how the WBS assists the Project Team in managing Work Packages at the schedule level for organizing, reporting and tracking.

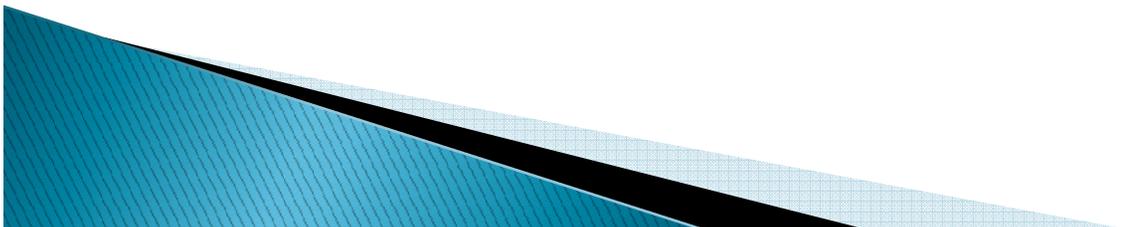


# What is a WBS?



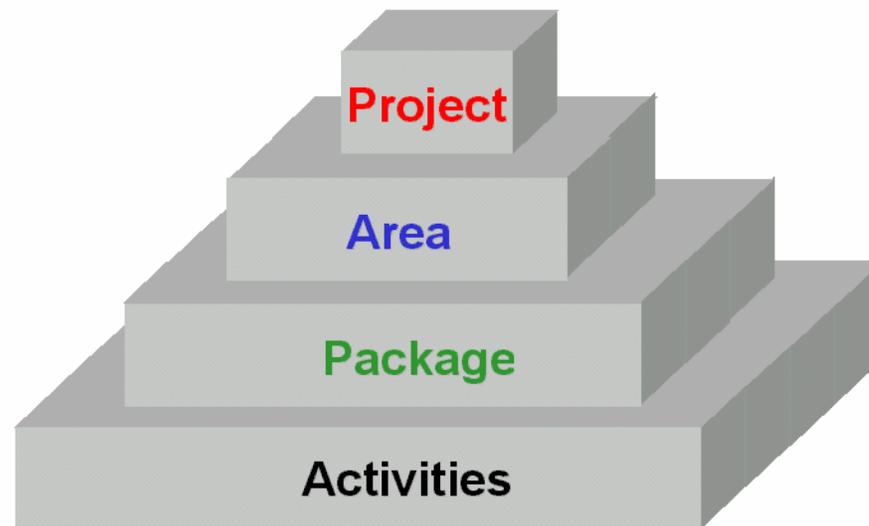
# Definition of a WBS

- ❖ A Work Breakdown Structure (WBS) is a fundamental project management technique for defining and organizing the total scope of a project, using a hierarchical tree structure.
  
- ❖ A well-designed WBS describes planned outcomes instead of planned actions. Outcomes are the desired ends of the project, such as a product, result, or service, and can be predicted accurately.



# Levels of a WBS

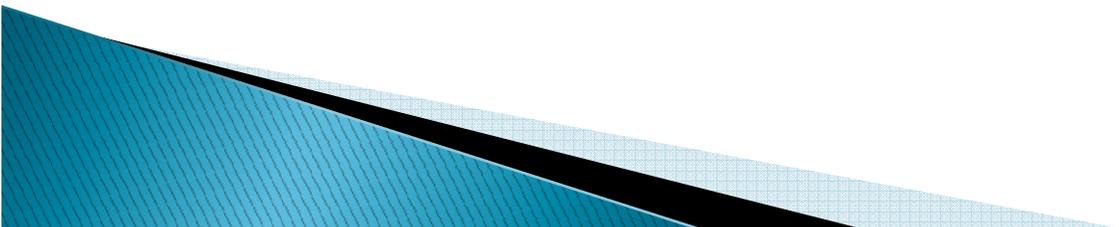
- ❖ The first two levels of the WBS (the root node and Level 2) define a set of *planned outcomes that collectively and exclusively* represent 100% of the project scope.
- ❖ At each subsequent level, the children of a parent node collectively and exclusively represent 100% of the scope of their parent node.



# The 100% Rule

❖ The 100% Rule...states that the WBS includes 100% of the work defined by the project scope and captures ALL deliverables – internal, external, interim – in terms of the work to be completed, including project management.

❖ The 100% rule is one of the most important principles guiding the development, decomposition and evaluation of the WBS.

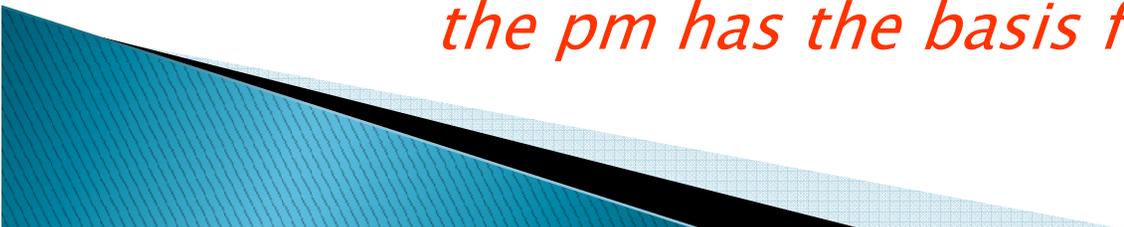


# W5 – Concept

- ❖ What has to be done?
- ❖ Where does it take place?
- ❖ Who has to do it?
- ❖ When does it have to be done?
- ❖ How much will it cost?



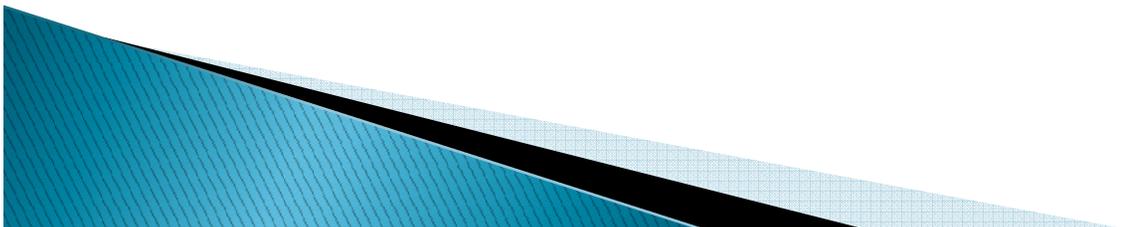
*When a project manager has this information,  
the pm has the basis for “control”*



# WBS–Work Breakdown Structure

What has to be done?

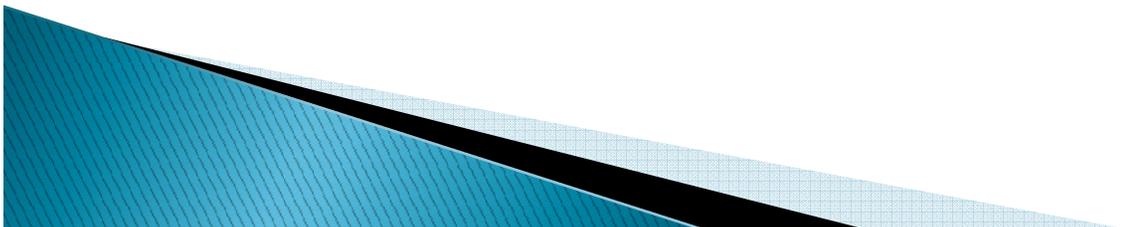
- ▶ Part of Project WBS
- ▶ Scope
- ▶ Deliverables
- ▶ Level Of Detail Required
- ▶ Site Conditions



# WBS–Work Breakdown Structure

Where does it take place?

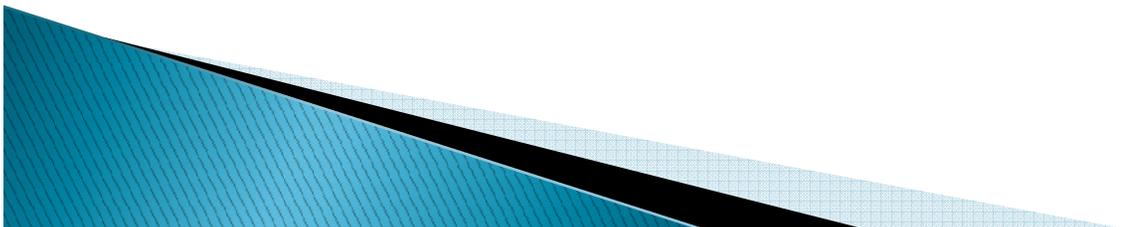
- ▶ Part of Project WBS
- ▶ Area
- ▶ Zone
- ▶ Location
- ▶ Level
- ▶ Stationing



# WBS–Work Breakdown Structure

Who has to do it?

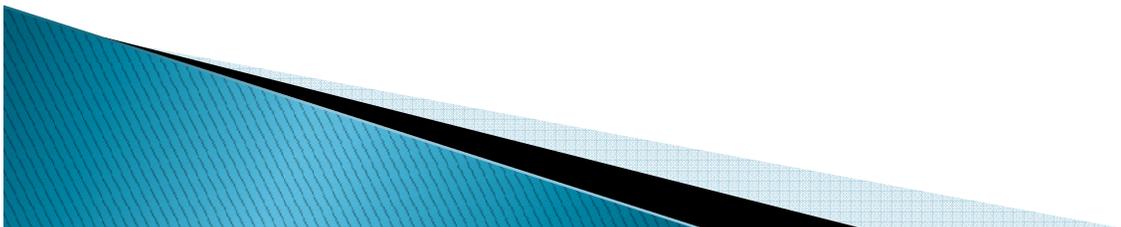
- ▶ Part of Project OBS
- ▶ Responsible Firm / Person
- ▶ Key Agency Interaction
- ▶ Responsibility Matrix



# WBS–Work Breakdown Structure

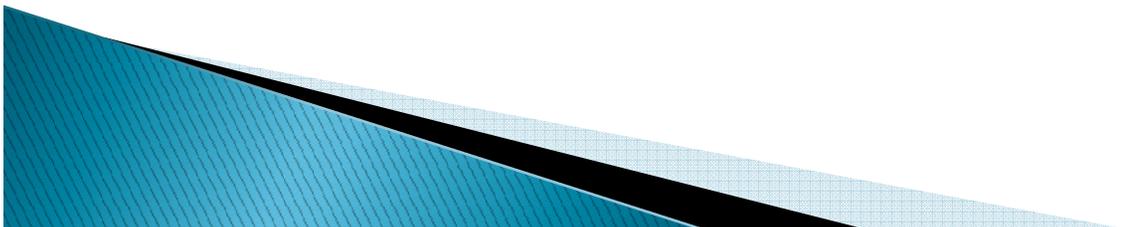
When does it have to be done?

- ▶ – Contractual Milestones
- ▶ – Access / Interface Dates
- ▶ – Limitations on Work Schedule/Dates



# WBS–Work Breakdown Structure

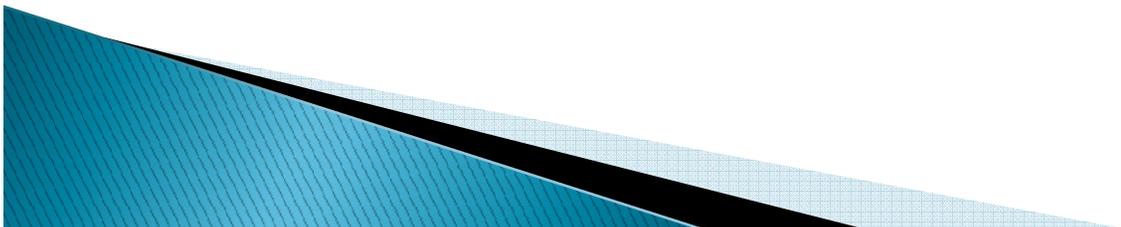
- ▶ The Project WBS should not be any more detailed than needed to communicate information to various levels of management
- ▶ A well defined and communicated WBS is the key to controlling information and effective communications



# The Four Elements in Each WBS Element

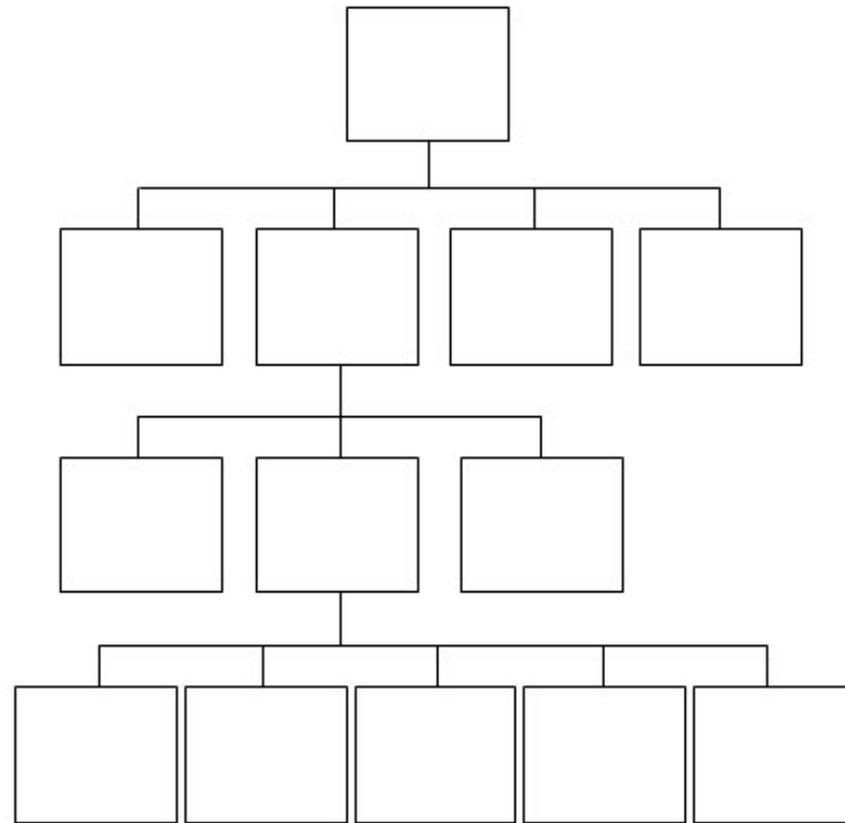
❖ Each WBS element, when completed should contain the following four items:

1. The scope of work, including any “deliverables.”
2. The beginning and end dates for the scope of work.
3. The budget for the scope of work.
4. The name of the person responsible for the scope of work.



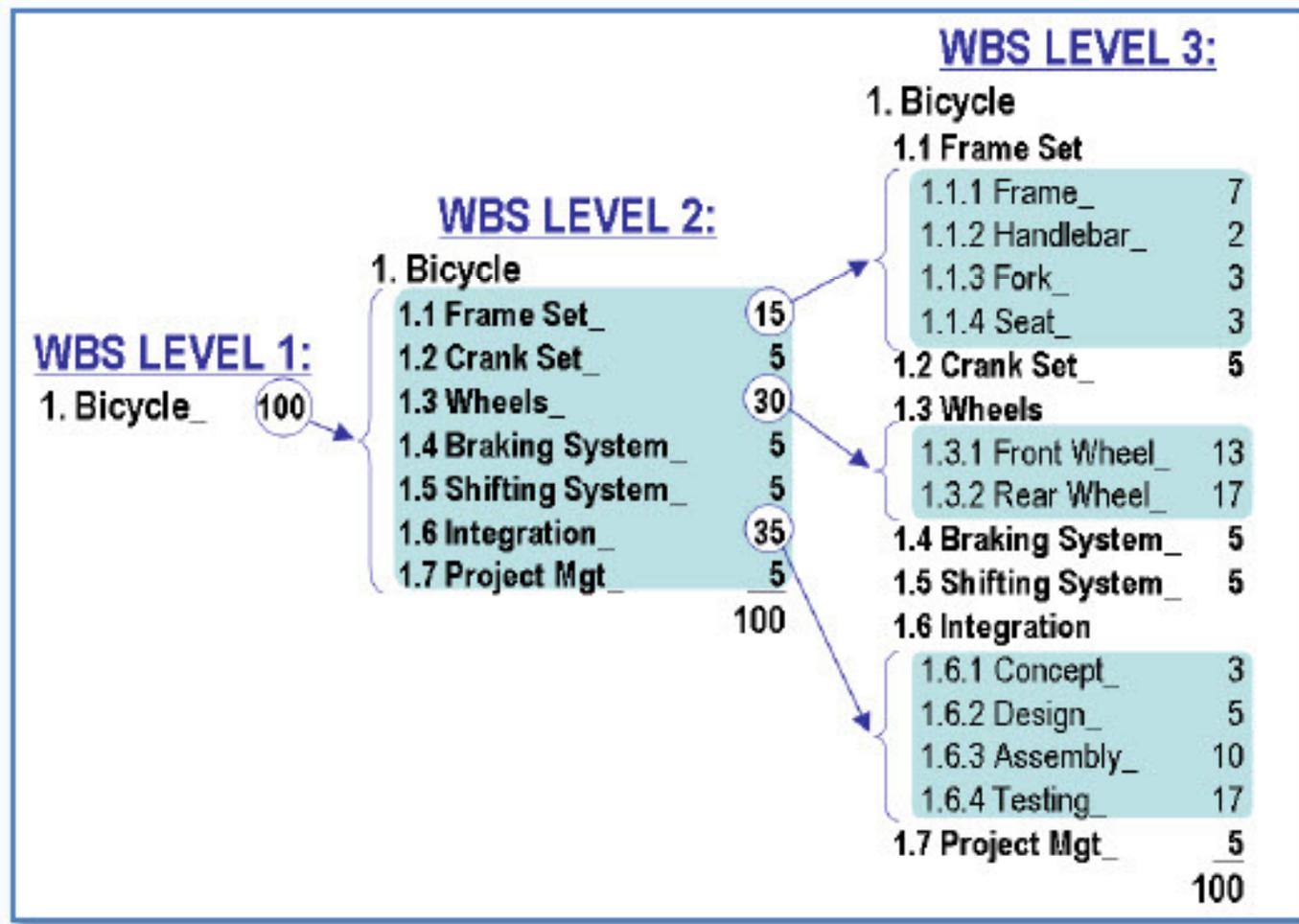
# WBS – Project Team Exercise

- ❖ Use a White Board
- ❖ Use Post it Notes
- ❖ Build in software (P6) using a projector to display on wall



# WBS – Identification Numbering

❖ It is common for WBS elements to be numbered sequentially to reveal the hierarchical structure.



# WBS – MnDOT Projects

- ❖ Click on the “WBS” Icon to modify the WBS Structure

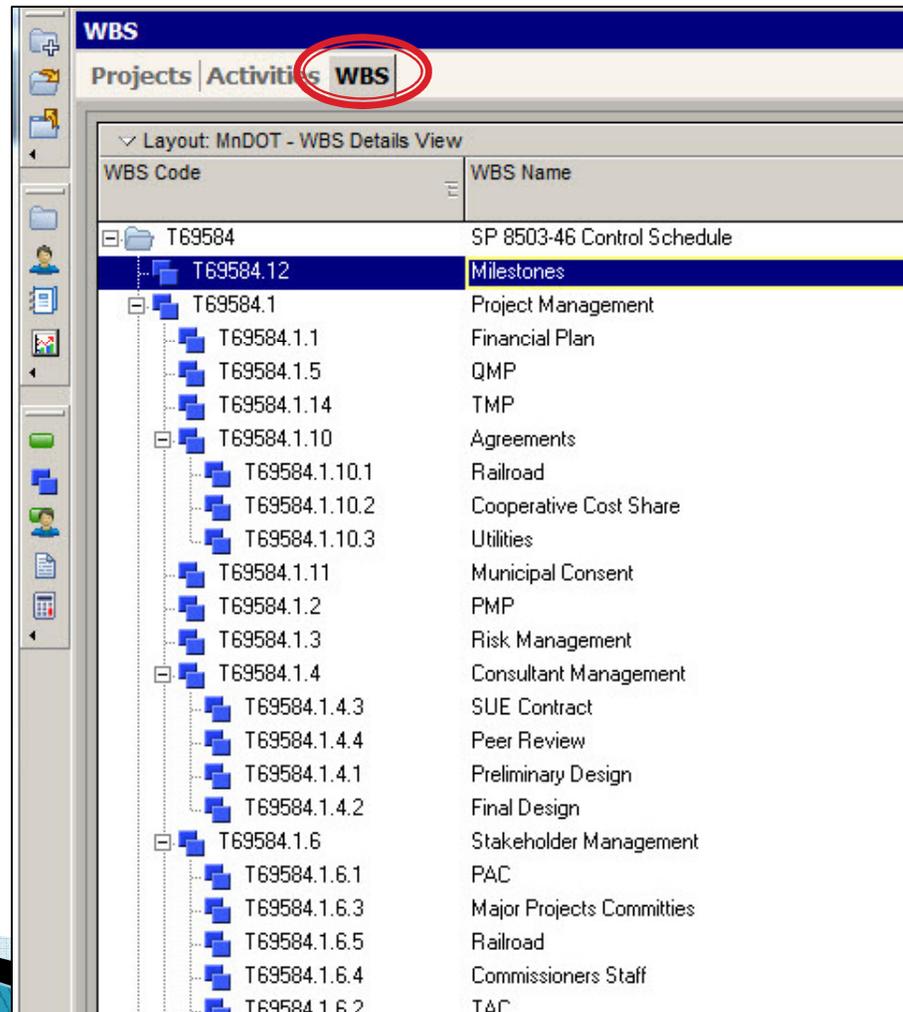
The screenshot displays the Primavera P6 software interface. The top navigation pane shows 'Activities' selected, with sub-tabs for 'Projects', 'Activities', and 'WBS'. The 'WBS' tab is active. Below the navigation pane, there is a table of activities and a Gantt chart.

#	Activity ID	Activity Name	Original Duration	Remaining Duration	Activity % Complete
23	<b>Project Management</b>		1892	1650	
24	<b>QMP</b>		1650	1195	
25	A4665	Develop Draft Project QMP	22	0	100%
26	A8140	Review Draft Project QMP	12	0	100%
27	A8150	Finalize Project QMP	1195	1195	0%
28	<b>TMP</b>		1037	1037	
29	A7500	Define Project Transportation Management Needs	5	5	0%
30	A7510	Refine/Review Transportation Management Needs	1027	1027	0%
31	A7520	Develop Transportation Management Plan	5	5	0%
32	<b>Municipal Consent</b>		167	167	
33	A22420	Submit Final Layout - Request Municipal Consent	1	1	0%
34	A22430	City Hearing - Municipal Consent	40	40	0%
35	A22440	City Council - Review and Approval Process	40	40	0%
36	A22450	Municipal Consent - Appeal Period	86	86	0%
37	<b>PMP</b>		15	15	
38	A4585	Develop Draft PMP	5	5	0%
39	A4595	Review PMP	5	5	0%
40	A4605	Finalize PMP	5	5	0%

The Gantt chart on the right shows the project schedule from January to May. Activities are represented by bars with arrows indicating dependencies. The 'WBS' icon in the left-hand navigation pane is circled in red.

# WBS – MnDOT Projects

- ❖ Use the “WBS Tab” to access the project WBS Structure



The screenshot shows a software interface with a 'WBS' tab highlighted in red. The interface displays a hierarchical tree structure of WBS items. The table below represents the data shown in the interface.

WBS Code	WBS Name
T69584	SP 8503-46 Control Schedule
T69584.12	Milestones
T69584.1	Project Management
T69584.1.1	Financial Plan
T69584.1.5	QMP
T69584.1.14	TMP
T69584.1.10	Agreements
T69584.1.10.1	Railroad
T69584.1.10.2	Cooperative Cost Share
T69584.1.10.3	Utilities
T69584.1.11	Municipal Consent
T69584.1.2	PMP
T69584.1.3	Risk Management
T69584.1.4	Consultant Management
T69584.1.4.3	SUE Contract
T69584.1.4.4	Peer Review
T69584.1.4.1	Preliminary Design
T69584.1.4.2	Final Design
T69584.1.6	Stakeholder Management
T69584.1.6.1	PAC
T69584.1.6.3	Major Projects Committies
T69584.1.6.5	Railroad
T69584.1.6.4	Commissioners Staff
T69584.1.6.2	TAC

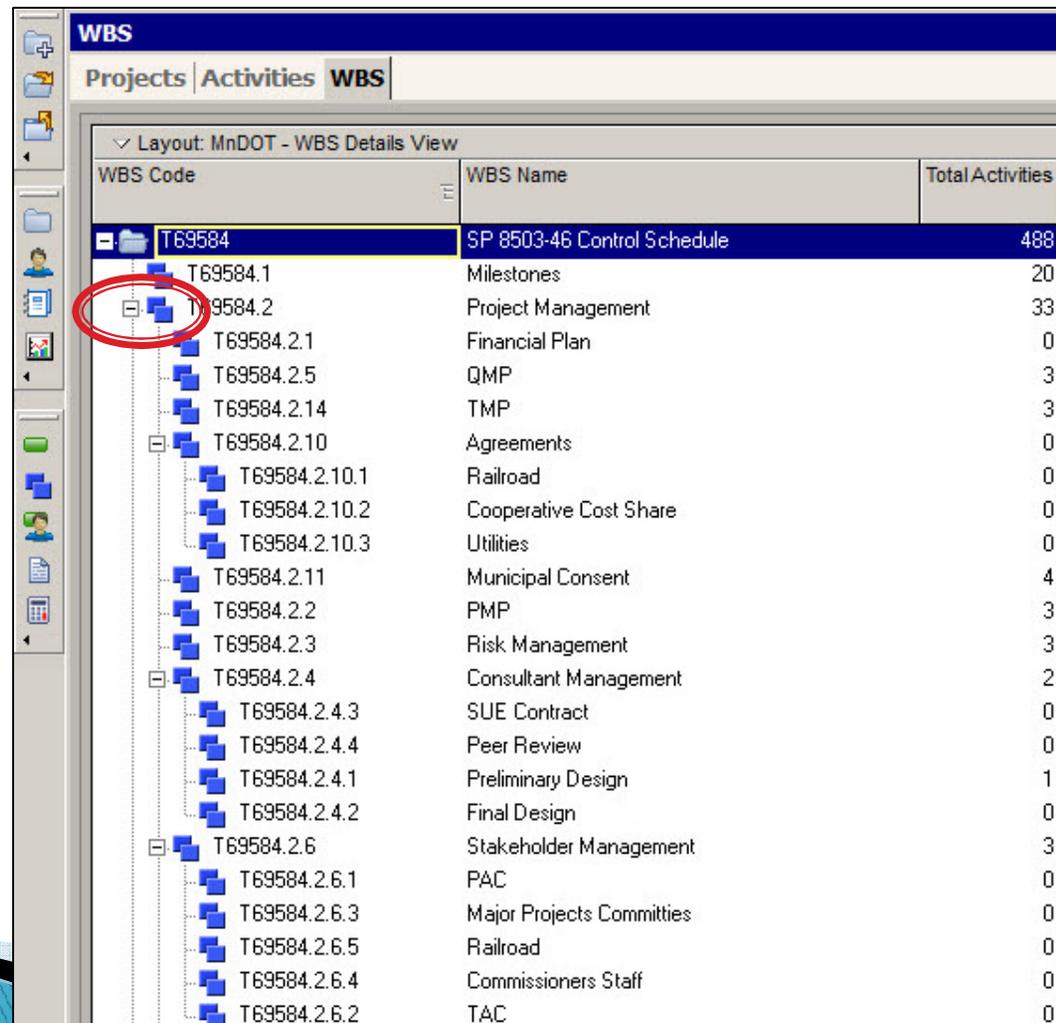
# WBS – MnDOT Projects

- ❖ Role Up the WBS Structure to Level 1 & 2 for Summary Information

WBS Code	WBS Name	Total Activities
T69584	SP 8503-46 Control Schedule	488
T69584.1	Milestones	20
+ T69584.2	Project Management	33
+ T69584.3	Preliminary Design	129
+ T69584.4	Final Design	95
+ T69584.5	Environmental Review	137
+ T69584.6	RW	49
+ T69584.7	Letting/Award	25
+ T69584.8	Construction	0

# WBS – MnDOT Projects

- ❖ Drill Down into Level 3 for more WBS detail



WBS Code	WBS Name	Total Activities
T69584	SP 8503-46 Control Schedule	488
T69584.1	Milestones	20
T69584.2	Project Management	33
T69584.2.1	Financial Plan	0
T69584.2.5	QMP	3
T69584.2.14	TMP	3
T69584.2.10	Agreements	0
T69584.2.10.1	Railroad	0
T69584.2.10.2	Cooperative Cost Share	0
T69584.2.10.3	Utilities	0
T69584.2.11	Municipal Consent	4
T69584.2.2	PMP	3
T69584.2.3	Risk Management	3
T69584.2.4	Consultant Management	2
T69584.2.4.3	SUE Contract	0
T69584.2.4.4	Peer Review	0
T69584.2.4.1	Preliminary Design	1
T69584.2.4.2	Final Design	0
T69584.2.6	Stakeholder Management	3
T69584.2.6.1	PAC	0
T69584.2.6.3	Major Projects Committees	0
T69584.2.6.5	Railroad	0
T69584.2.6.4	Commissioners Staff	0
T69584.2.6.2	TAC	0

# WBS – MnDOT Projects

- ❖ Group the schedule by “WBS Level 1” to view in the Activity Window

The screenshot displays the Primavera P6 software interface. The main window shows a WBS hierarchy for 'SP 8503-46 Control Schedule'. The 'Project Management' level is highlighted in green. A red arrow points from the 'Project Management' level in the main window to the 'WBS level 1' entry in the 'Group and Sort' dialog box. The 'Group and Sort' dialog box is open, showing the 'Group By' table with 'WBS level 1' selected. The 'Font & Color' column for 'WBS level 1' is highlighted in blue with '12 Arial' font. Other levels are listed with different colors and fonts: 'WBS level 2' (green, 11 Arial), 'WBS level 3' (yellow, 9 Arial), 'WBS level 4' (blue, 8 Arial), 'WBS level 5' (red, 8 Arial), and 'WBS level 6' (cyan, 8 Arial). The 'Group By Options' section is also visible, with 'Name / Description' checked.

Group By	Indent	To Level	Group Interval	Page Break	Font & Color
WBS level 1	<input checked="" type="checkbox"/>	All		<input type="checkbox"/>	12 Arial
WBS level 2	<input type="checkbox"/>			<input type="checkbox"/>	11 Arial
WBS level 3	<input type="checkbox"/>			<input type="checkbox"/>	9 Arial
WBS level 4	<input type="checkbox"/>			<input type="checkbox"/>	8 Arial
WBS level 5	<input type="checkbox"/>			<input type="checkbox"/>	8 Arial
WBS level 6	<input type="checkbox"/>			<input type="checkbox"/>	8 Arial

# Group by WBS in Activity Window

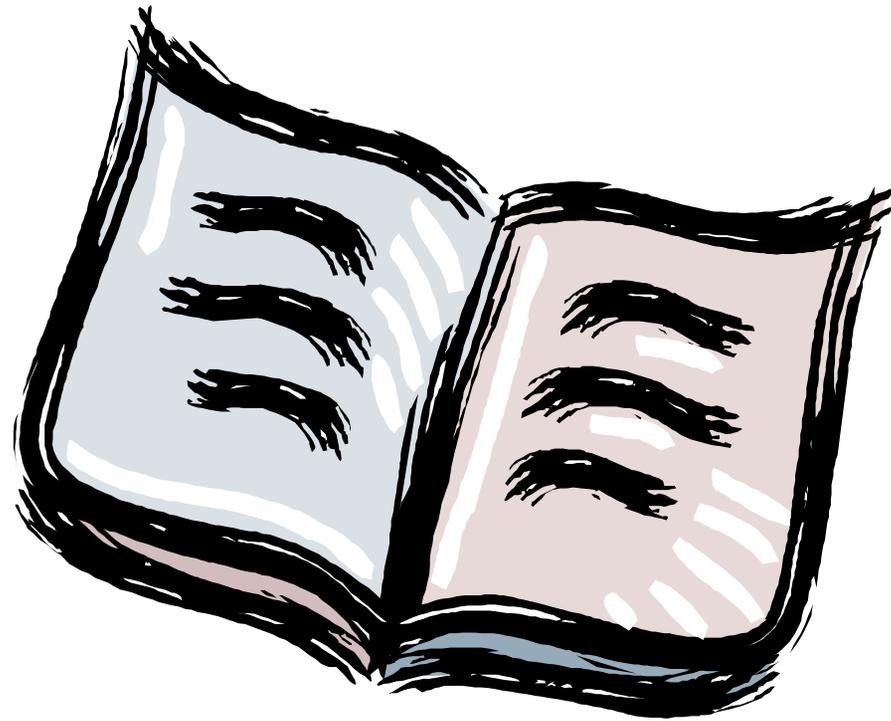
- ❖ Grouping by WBS is the Standard “Layout” for the Project Schedule
- ❖ Use the “MnDOT – Classic WBS Layout (Default)”

The screenshot displays the 'Activities' window in a project management software. The 'Activities' tab is selected, and the layout is set to 'MnDOT - Classic WBS Layout (Default)'. The table below shows the activity details, and the Gantt chart on the right shows the schedule for these activities.

#	Activity ID	Activity Name	Original Duration	Remaining Duration	Activity % Complete
23	<b>Project Management</b>				
24	<b>QMP</b>				
25	A4665	Develop Draft Project QMP	22	0	100%
26	A8140	Review Draft Project QMP	12	0	100%
27	A8150	Finalize Project QMP	1195	1195	0%
28	<b>TMP</b>				
29	A7500	Define Project Transportation Management Needs	5	5	0%
30	A7510	Refine/Review Transportation Management Needs	1027	1027	0%
31	A7520	Develop Transportation Management Plan	5	5	0%
32	<b>Municipal Consent</b>				
33	A22420	Submit Final Layout - Request Municipal Consent	1	1	0%
34	A22430	City Hearing - Municipal Consent	40	40	0%
35	A22440	City Council - Review and Approval Process	40	40	0%
36	A22450	Municipal Consent - Appeal Period	86	86	0%
37	<b>PMP</b>				
38	A4585	Develop Draft PMP	5	5	0%
39	A4595	Review PMP	5	5	0%
40	A4605	Finalize PMP	5	5	0%



# Glossary of CPM Terms



# Glossary of CPM Terms

**Activity** - An individual work task that is the basic component of a project.

**Activity Codes** - Values assigned to project activities to organize them into manageable groups for updating, analyzing, reporting, plotting, and summarizing.

**Actual Cost** - The cost incurred to date for a resource or activity.

**Actual Dates** - Start (AS) and Finish (AF) dates that you record for an activity that has progress or is complete.

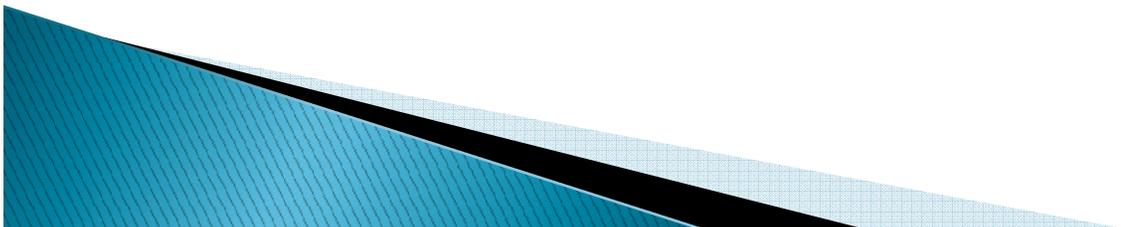
**Actual Quantity** - The amount of a resource used to date.

**Backward Pass** - The calculation of a network's late dates.

**Bar Chart** - The graphical display of activities according to time. Relationships between activities are not shown. A bar chart is also called a Gantt Chart.

**Baseline Schedule** - The original planned schedule for a project.

**Budget** - The estimate of the total units or costs required by a resource or cost account for an activity.



# Glossary of CPM Terms

**Calendar** - The workdays and holidays defined for a project that determine when an activity can be scheduled.

**Completion** - The date on which a project is to be finished.

**Constraint** - A restriction imposed on the start or finish of an activity.

**Critical Activity** - An activity that has the least amount of total float.

**Critical Path** - The series of activities in a project that will take the longest to complete.

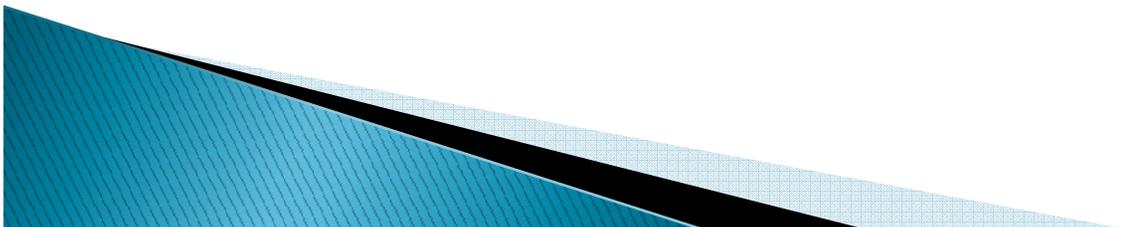
**Critical Path Method (CPM)** - The calculation of the earliest and latest start and finish dates of activities based on their duration and relationships to other activities.

**Data Date** - The date used as the starting point for schedule calculations.

**Driving** - A predecessor/successor relationship in which the predecessor

**Relationship** - Determines the successor's early dates.

**Duration** - The amount of time (in workdays) needed to complete an activity.



# Glossary of CPM Terms

**Early Start (ES)** - The earliest date when an activity can begin after its predecessors have been completed.

**Earned Value** - The value of work performed rather than actual work performed.

**Exception** - A day when work must occur that was originally designated as a nonworkday.

**Finish to Finish** - A type of relationship in which a successor activity finish depends on its **(FF)** predecessor activity's finish.

**Finish-to Start** - A type of relationship in which a successor activity can begin only when its **(FS)** predecessor activity finishes.

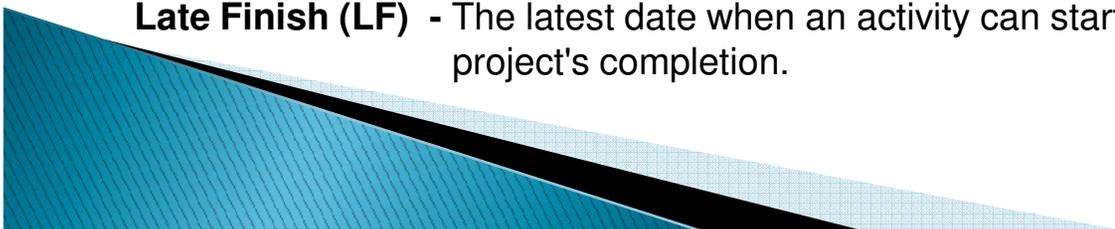
**Float** - The amount of time that the start or finish of an activity can be delayed without affecting the project finish date.

**Forward Pass** - The calculation of the network's early dates.

**Free Float** - The amount of time that an activity's early start can be delayed without delaying the early start of a successor activity.

**Lag** - An offset or delay from an activity to its successor.

**Late Finish (LF)** - The latest date when an activity can start without delaying the project's completion.



# Glossary of CPM Terms

**Late Start (LS)** - The latest date when an activity can start without delaying the project's completion.

**Loop** - Circular logic within a network.

**Milestone** - An activity that represents a significant point in time, that has no duration.

**Negative Float** - The total number of days that the start or finish of an activity exceeds the time allowed. Negative float indicates a delay in the schedule.

**Negative Lag** - An offset or lead time from an activity to its successor in which the successor's start date is earlier than the predecessor's start date.

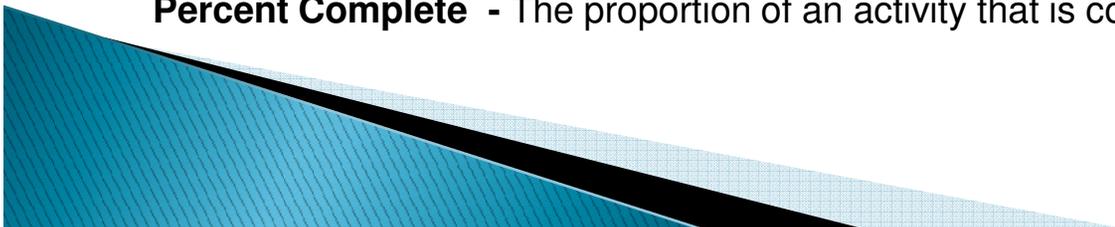
**Network** - The series of activities required to complete a project.

**Nonworkperiod** - A period of time when work may not occur.

**Open End** - An activity that has no successor or predecessor relationships to other activities in the network.

**Out-of-Sequence Progress** - Work completed for an activity before it is logically scheduled to occur.

**Percent Complete** - The proportion of an activity that is complete.



# Glossary of CPM Terms

**Performance Measurement** - The comparison of the current plan to a target plan to assess whether it is progressing as intended.

**Planning Unit** - The increment of time used to schedule a project. The planning unit can be in hours, days, weeks, or months.

**Predecessor** - An activity that must logically occur before another activity.

**Progress** - The completion of work.

**Resources** - The people, materials, equipment or services required to complete a project.

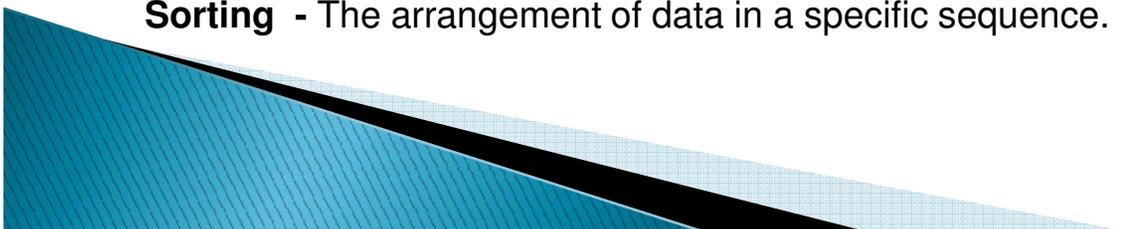
**Schedule** - A list of the activities needed to complete a project, along with their start and finish dates.

**Schedule Calculation** - The calculation of early and late dates for each activity in the project.

**Slack** - See Float.

**Slippage** - Lateness determined by measuring the target finish of an activity from its actual or current early finish.

**Sorting** - The arrangement of data in a specific sequence.



# Glossary of CPM Terms

**Start-to Start** - A type of relationship in which a successor's start depends on the start of **(SS)** its predecessor.

**Status** - The process of updating a project by indicating progress at regular intervals.

**Successor** - An activity that must logically occur after another activity.

**Target** - A project plan that can be compared to the current schedule to measure progress.

**Task** - A unit of work. Also called an activity.

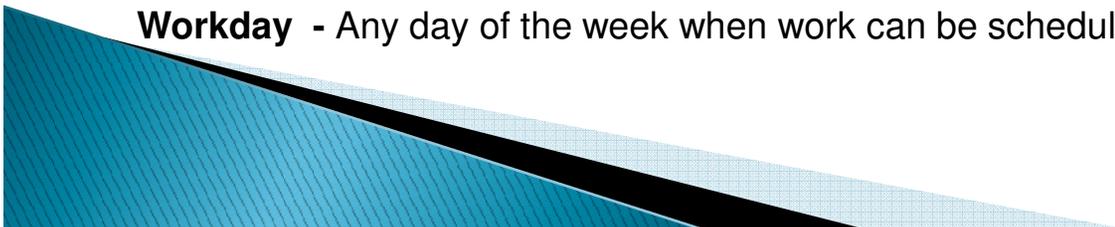
**Total Float (TF)** - The total number of days that the start or finish of an activity can be delayed without affecting the project finish date. Float can be negative, zero, or positive.

**Updating** - The process of recording progress in a project at regular intervals.

**Variance** - The difference between the current and target schedule dates.

**Work Breakdown Structure (WBS)** - The graphical depiction of the hierarchy of work needed to complete a project.

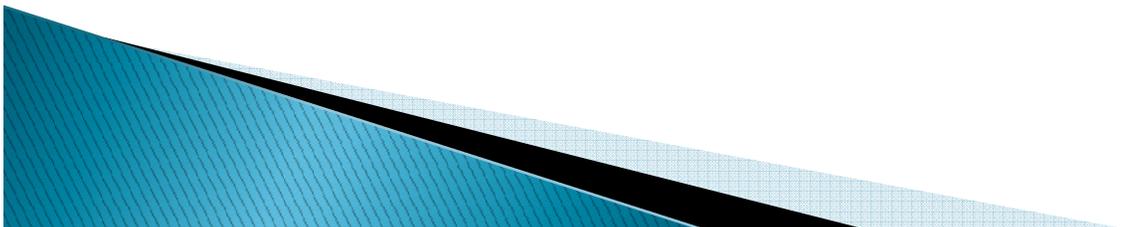
**Workday** - Any day of the week when work can be scheduled.



# MnDOT Goals Going Forward

## Projects in Construction Phase

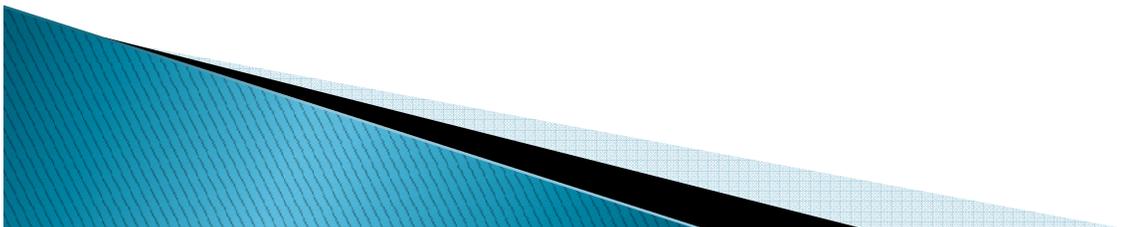
- ❖ Contractor's Build Their Schedule in our Network 1/1/13
- ❖ Piloting Providing BIM Models and CTD Schedules to Contractors 3/1/13
- ❖ Select "Unit Rate" project– Resource and Cost Loaded 3/1/13
- ❖ Role and Resource Loaded of CE&I staff 6/1/14



# MnDOT Goals Going Forward

## Projects in Scoping and Design Phase

- ❖ “Active Projects” Role and Resource Loaded 6/30/13
- ❖ All planned projects Role loaded by June 30, 2014
- ❖ Taxpayer Transportation Accountability Act





# Questions or Comments

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**Next Webinar: Wednesday, April 10, 2013**

**Time: 1:00 p.m.**

**Topic: Schedule Float**

**Presenter: Jonathan McNatty**

**DRMcNatty & Associates, Inc.**

