Construction Scheduling Manual

2013

Prepared by Construction Management

1.0 Introduction

Designer and Contractors are to use this manual to create construction schedules for Designers and Contractors. Most construction projects involve the reconstruction of existing highways, which means that traffic will be disrupted. It is important that Designers and Contractors understand that work must be planned and executed efficiently to minimize these disruptions.

1.1 Definitions

Activity - A fundamental work element of a project. It contains all the necessary information to perform the required work. It is the lowest level of a work breakdown structure.

Actual Start Date - The point in time that work actually started on an activity.

Actual Finish Date - The point in time that work actually ended on an activity. Note: in some applications areas, the activity is considered "finished" when work is "substantially complete."

Baseline Schedule - The original plan against which your progress is measured. The baseline represents the original plan at the onset of the project of what you expect to happen. The baseline is saved once the schedule is presented to the stakeholders and other interested parties, and has been agreed to by all parties.

Critical Path –The path of activities through a network diagram that determines the project's earliest finish date. The critical path will generally change from time to time as activities are completed ahead of or behind schedule. Although normally calculated for the entire project, the critical path can also be determined for a milestone or subproject. The critical path is usually defined as those activities with float less than or equal to a specified value, often zero.

Critical Path Method (CPM) – A network analysis technique used to predict duration by analyzing which sequence of activities (which path) has the least amount of scheduling flexibility (the least amount of float). Early dates are calculated by means of a forward pass using a specified start date. Late dates are calculated by means of a backward pass starting from a specified completion date (usually the forward pass's calculated project early finish date).

Deliverable – Any measurable, tangible, verifiable outcome, result, or item that must be produced to complete a project or part of a project. Often used more narrowly in reference to an external deliverable, this is a deliverable that is subject to approval by the project sponsor or customer.

Duration – The number of working days (not including holidays or other non-working periods) to complete an activity or other project element.

Early Dates - Earliest an activity can start or finish based upon relationships and constraints. Calculated by the computer during the forward pass.

Filter - A limit on projects or activities that are displayed. Criteria you establish determine which items appear. A filter, once created, can be assigned to layouts.

Fragnet – A subdivision of a project network diagram usually representing some portion of project. A Fragnet is provided as part of a Time Impact Evaluation (TIE) Form DC-161.

Free Float - The amount an activity can slip without delaying the next activity. This could be important for resource management.

Lane Occupancy – When a Contractor occupies a lane(s) in proceeding with their work. The Contractor will pay a Lane Occupancy Charge (per direction) for the period of time a lane is unavailable to the traveling public beyond the allowable lane closure time limits.

Late Dates – "Drop dead dates". The latest an activity can start or finish without effecting the end date of the project. Calculated by the computer during the backward pass.

Milestone - A type of activity used to represent the beginning or the end of a major stage, or an important event in a project. Start and finish milestones cannot have durations.

Predecessor - An activity that must occur before another activity. A predecessor activity controls the start or finish date of its successors. An activity can have multiple predecessors.

Preliminary Schedule – Initial schedule prior to the baseline schedule reflecting how the contractor plans to proceed with constructing a project.

Recovery Plan – Contractor's plan to bring the project back on schedule. This includes a revised CPM schedule and additional manpower and equipment.

Relationships Types

Finish to Start - The successor activity can begin only when the current activity completes

Finish to Finish – The finish of the successor activity depends on the finish of the current activity

Start to Start – The start of the successor activity depends on the start of the current activity

Start to Finish – The successor activity cannot finish until the current activity starts

Remaining Duration – The time needed to complete an activity.

Successor - An activity that must occur after another activity. An activity can have multiple successors, each with a different relationship to it. Every activity must have a successor except the project's finish milestone.

Time Impact Evaluation (TIE) Form DC-186 - A form provided by the NJDOT that facilitates a simplified analysis procedure used to award Contract Time due for delays that were not the responsibility of the Contractor. A fragnet is associated with the modeling of the effects of the delay. A CPM schedule that is able to show the pure CPM calculation differences between a schedule that does not include a delay and one that does include a fragnet modeling the delay. The difference in Contract Time between the non-impacted schedule and that of the schedule with the impact is considered to be the impact of the delay for a potential Contract Time extension.

Total Float - The amount of time an activity can be delayed without delaying the project finish date.

Updated Schedule – A schedule that truly reflects the current means and method how the project is progressing.

Work Breakdown Structure (WBS) - A deliverable-oriented grouping of project elements, which organizes and defines the total scope of the project. Each descending level represents an increasingly detailed definition of a project component.

Working Schedule – A schedule utilized for duration of a project for creation of the baseline schedule and updates.

Work Package - A deliverable at the lowest level of the work breakdown structure. A work package contains activities.

2.0 Scheduling Software

The New Jersey Department of Transportation, Capital Program Management has adopted the use of Primavera software in XER format as the standard format for progress schedules. This software and format will be updated as newer versions become available. At Final Design, the Designer will develop a construction schedule for the proposed project. See Appendix A for an example of a Primavera Schedule view.

The Contractor will submit a preliminary and baseline construction schedule and submit bi-monthly schedule updates. All construction schedules will conform to the requirements of this manual.

3.0 Standard Practices

In developing a schedule, three basic items make CPM scheduling work:

- Clearly defined activities
- Realistic duration's
- Good logic

Other good practices include:

- Negative lags will not be permitted.
- Do not use a Finish to Start relationship with a lag. An activity must be added to represent the lag time.
- A project has one beginning and one end. All activities have a predecessor and successor except the project's start and finish milestones. No "Open Ends" will be permitted.
- Durations of work activities do not exceed the update cycle. The Department requires the update cycle to be prepared bi-monthly.
- "Suspension of Dates" will not be permitted. An activity must be added.
- If an activity has a Start-to-Start relationship - it is to be closed with a Finish-to-Finish or Finish-to-Start relationship. (No open ends)
- The completion date of the CPM schedule is the completion date in Subsection 108.10 of the project's Special Provisions, which is be input as a Finish Milestone with a Late Finish Constraint. All intermediate milestones (Interim Completion Dates) required in the Contract are to be shown in proper logical sequence and input as either the "Start-no-Earlier-Than" or "Finish-no-Later-Than" date. Mandatory Finish and Mandatory Starts are not to be used.
- When updating, all "Out of Sequence" activities are to be corrected to reflect the current construction operations.
- Original durations will not be changed from the approved Baseline Schedule.

4.0 Standard Coding

As a means of monitoring progress schedules, the Department has developed with the Consultant and Construction industries common coding structure and procedures to be utilized from design through construction. The Designer and Contractor is required to utilize the Primavera template project containing the latest standard coding provided from the Department's web site. Details regarding template usage are provided in Appendix C.

4.1 Work Breakdown Structure (WBS) Milestones

Activity ID	Activity Description
M100	Advertise Date (Start Milestone)
M200	Bid Date (Start Milestone)
M300	Award Date (Start Milestone)
M400	Start Design Work (Design/Build only) (Start Milestone)
M480	Complete Design Work (Design/Build only) (Finish Milestone)
M500	Construction Start Date (Start Milestone)
M600	Stage_ Complete (increase by 5) (Finish Milestone)
M700	Interim Completion Date(s) (Increase by 10) (Finish Milestone)
M800	ROW Availability Date(s) (Increase by 5) (Finish Milestone)
M900	Substantial Completion (Finish Milestone)
M950	Completion (Finish Milestone)

4.1.1 Work Breakdown Structure

WBS Code	Title
0	Milestones
C	**Construction**
C.00	Administrative
C.01	Stage 1
C.01.1A	Stage 1 A
C.01.1B	Stage 1 B
C.01.1C	Stage 1 C
C.01.1D	Stage 1 D
C.01.1E	Stage 1 E
C.02	Stage 2
C.02.2A	Stage 2 A
C.02.2B	Stage 2 B
C.02.2C	Stage 2 C
C.02.2D	Stage 2 D
C.02.2E	Stage 2 E
C.03	Stage 3
C.03.3A	Stage 3 A
C.03.3B	Stage 3 B
C.03.3C	Stage 3 C
C.03.3D	Stage 3 D
C.03.3E	Stage 3 E
C.10	Final Cleanup
D	**Design (Design/Build only)**
P	**Procurement**
P.CS	Contractor Submittals (Not Materials)
P.CS.01	Safety Plan
P.CS.02	Night Lighting
P.CS.03	Demolition
P.CS.04	Disposal
P.CS.05	Paving
P.CS.06	Steel Erection
P.CS.07	Health and Safety Plan
P.CS.08	Deck Placement

P.PP	Permits
P.PP.01	Environmental
P.PP.02	Dewatering
P.MS	Material Submittals (Long Lead Items)
P.MS .01	Concrete
P.MS .02	Structural Steel
P.MS .03	Asphalt
P.MS .04	Electrical
P.MS .05	Sheeting/Cofferdam
P.WD	Working Drawings
P.WD .01	Bridge Working Drawings
P.WD.01.01	Bridge Working Drawings Requiring Design
P.WD.01.01.01	Structural Steel Working Drawings
P.WD.01.01.02	Structural Bearings
P.WD.01.01.03	Prestressed Concrete Beams
P.WD.01.01.04	Prestressed Concrete Piles
P.WD.01.01.05	Expansion Dams
P.WD.01.01.06	Cofferdams
P.WD.01.01.07	Sheeting
P.WD.01.01.08	Machinery for Movable Bridges
P.WD.01.01.09	Electrical Items for Movable Bridges
P.WD.01.01.10	Precast Concrete Culverts
P.WD.01.01.11	Steel Bridge Deck Forms
P.WD.01.01.12	Prefabricated Modular Walls
P.WD.01.01.13	Mechanical Stabilized Earth (MSE) Walls
P.WD.01.01.14	Concrete Crib Walls
P.WD.01.01.15	Alternate Retaining Wall Design
P.WD.01.01.16	Temporary Structures
P.WD.01.01.17	Temporary Shielding
P.WD.01.01.18	Electrical Items not pre-approved
P.WD.01.02	Bridge Working Drawings Not Requiring Design
P.WD.01.02.01	Structural Steel Working Drawings
P.WD.01.02.02	Structural Bearings
P.WD.01.02.03	Prestressed Concrete Beams
P.WD.01.02.04	Prestressed Concrete Piles
P.WD.01.02.05	Expansion Dams
P.WD.01.02.06	Cofferdams
P.WD.01.02.07	Machinery for Movable Bridges
P.WD.01.02.08	Electrical Items for Movable Bridges
P.WD.01.02.09	Strip Seals
P.WD.01.02.10	Armored Deck Joints
P.WD.01.02.11	Bridge Storm Drains
P.WD.01.02.12	Sign Support Structures
P.WD.01.02.13	GA Sign Support Posts
P.WD.01.02.14	Noise Barriers
P.WD.01.02.15	Bridge Railings and Fencing Anchorages
P.WD.01.02.16	Sign Legends
P.WD.02	Road Working Drawings
P.WD.02.01	Road requiring design
P.WD.02.01.01	Impact attenuators
P.WD.02.01.02	Sheeting

P.WD.02.01.03	Electrical items not pre-approved
P.WD.02.02	Road not requiring design
P.WD.02.02.01	Impact attenuators
P.WD.02.02.02	Sign legends
P.WD.02.02.03	Recycled/synthetic routed spacers
U	Utility

4.2 Standard Activity Codes

4.2.1 RESP Responsibility

RESP Code	Title
CONP	Prime Contractor
CONA	Adjacent Contractor
NACO	Army Corp of Engineers
NCOG	Coast Guard
NDBC	Delaware Bridge Commission
NDEP	New Jersey DEP
NDOT	New Jersey Department of Transportation
NDPA	Delaware Port Authority
NSJT	South Jersey Transportation Authority
NGSP	NJ Highway Authority
NPCM	Pinelands Commission
NPPA	Palisades Parkway
NPTA	Port Authority of NY and NJ
NTPK	New Jersey Turnpike
THRD	Third Party (Property owners, etc.)
UACE	Atlantic City Electric DBA Connective
UAMT	Amtrak
UATT	AT&T
UCBL	Cable Utility
UCVE	City of Vineland Electric Co.
UELG	Elizabethtown Gas
UELW	Elizabethtown Water Company
UGPN	JCP&L DBA GPU Energy - (North)
UGPS	JCP&L DBA GPU Energy - (South)
UMCI	MCI WorldCom
UMIW	Middlesex Water
UNGN	New Jersey Natural Gas (North)
UNGS	New Jersey Natural Gas (South)
UNJT	New Jersey Transit
UNJW	New Jersey American Water
UNWC	United Water Company
UPEC	Public Service Electric (Central)
UPEM	Public Service Electric (Metropolitan)
UPEP	Public Service Electric (Palisades)
UPES	Public Service Electric (Southern)
UPGN	Public Service Gas (North)
UPGS	Public Service Gas (South)
UPVS	Passaic Valley Sewerage Commission
UPVW	Passaic Valley Water Commission
UREL	Rockland Electric
URCR	Consolidated Rail Corporation
URNS	Norfolk and Southern Railroad
URCS	CSX Transportation Inc.
URNY	New York Susquehanna & Western Railway Corporation
USCC	Sprint Communications Company L.P.
USJG	South Jersey Gas
USPT	Sprint DBA United Telephone Co of NJ

UVER	Verizon Communications

4.2.2 County Codes

Code	County
0100	**Atlantic County**
0101	Absecon City
0102	Atlantic City
0103	Brigantine City
0104	Buena Borough
0105	Buena Vista Township
0106	Corbin City
0107	Egg Harbor City
0108	Egg Harbor Township
0109	Estell Manor City
0110	Folsom Borough
0111	Galloway Township
0112	Hamilton Township
0113	Hammonton Town
0114	Lindwood City
0115	Longport Borough
0116	Margate City
0117	Mullica Township
0118	Northfield City
0119	Pleasantville City
0120	Port Republic City
0121	Somers Point City
0122	Ventnor City
0123	Weymouth Township
0200	**Bergen County**
0201	Allendale Borough
0202	Alpine Borough
0203	Bergenfield Borough
0204	Bogota Borough
0205	Carlstadt Borough
0206	Cliffside Park Borough
0207	Closter Borough
0208	Cresskill Borough
0209	Demarest Borough
0210	Dumont Borough
0212	East Rutherford Borough
0213	Edgewater Borough
0211	Elmwood Park Borough
0214	Emerson Borough
0215	Englewood City
0216	Englewood Cliff Borough
0217	Fair Lawn Borough
0218	Fairview Borough
0219	Fort Lee Borough
0220	Franklin Lakes Borough
0221	Garfield City

0222	Glen Rock Borough
0223	Hackensack City
0224	Harrington Park Borough
0225	Hasbrouck Heights Borough
0226	Haworth Borough
0227	Hillsdale Borough
0228	Hohokus Borough
0229	Leonia Borough
0230	Little Ferry Borough
0231	Lodi Borough
0232	Lyndhurst Township
0233	Mahwah Township
0234	Maywood Borough
0235	Midland Park Borough
0236	Montvale Borough
0237	Moonachie Borough
0238	New Milford Borough
0239	North Arlington Borough
0240	Northvale Borough
0241	Norwood Borough
0242	Oakland Borough
0243	Old Tappan Borough
0244	Oradell Borough
0245	Palisades Park Borough
0246	Paramus Borough
0247	Park Ridge Borough
0248	Ramsey Borough
0249	Ridgefield Borough
0250	Ridgefield Park Village
0251	Ridgewood Village
0252	River Edge Borough
0253	Rivervale Township
0254	Rochelle Park Township
0255	Rockleigh Borough
0256	Rutherford Borough
0257	Saddle Brook Township
0258	Saddle River Borough
0259	South Hackensack Township
0260	Teaneck Township
0261	Tenafly Borough
0262	Teterboro Borough
0263	Upper Saddle River Borough
0264	Waldwick Borough
0265	Wallington Borough
0266	Washington Township
0267	Westwood Borough
0268	Woodcliff Lake Borough
0269	Wood Ridge Borough
0270	Wyckoff Township
0300	**Burlington County**
0301	Bass River Township

0302	Beverly City
0303	Bordentown City
0304	Bordentown Township
0305	Burlington City
0306	Burlington Township
0307	Chesterfield Township
0308	Cinnaminson Township
0309	Delanco Township
0310	Delran Township
0311	Eastampton Township
0312	Edgewater Park Township
0313	Evesham Township
0314	Fieldsboro Borough
0315	Florence Township
0316	Hainesport Township
0317	Lumberton Township
0318	Mansfield Township
0319	Maple Shade Township
0320	Medford Township
0321	Medford Lakes Borough
0322	Moorestown Township
0323	Mount Holly Township
0324	Mount Laurel Township
0325	New Hanover Township
0326	North Hanover Township
0327	Palmyra Borough
0328	Pemberton Borough
0329	Pemberton Township
0330	Riverside Township
0331	Riverton Borough
0332	Shamong Township
0333	Southampton Township
0334	Springfield Township
0335	Tabernacle Township
0336	Washington Township
0337	Westampton Township
0338	Willingboro Township
0339	Woodland Township
0340	Wrightstown Borough
0400	**Camden County**
0401	Audubon Borough
0402	Audubon Park Borough
0403	Barrington Borough
0404	Bellmawr Borough
0405	Berlin Borough
0406	Berlin Township
0407	Brooklawn Borough
0408	Camden City
0409	Cherry Hill Township
0410	Chesilhurst Borough
0411	Clementon Borough

0412	Collingswood Borough
0413	Gibbsboro Borough
0414	Gloucester City
0415	Gloucester Township
0416	Haddon Township
0417	Haddonfield Borough
0418	Haddon Heights Borough
0419	Hi Nella Borough
0420	Laurel Springs Borough
0421	Lawnside Borough
0422	Lindenwold Borough
0423	Magnolia Borough
0424	Merchantville Borough
0425	Mount Ephraim Borough
0426	Oaklyn Borough
0427	Pennsauken Township
0428	Pine Hill Borough
0429	Pine Valley Borough
0430	Runnemede Borough
0431	Somerdale Borough
0432	Stratford Borough
0433	Tavistock Borough
0434	Voorhees Township
435	Waterford Township
0436	Winslow Township
0437	Woodlynne Borough
0500	**Cape May County**
0501	Avalon Borough
0502	Cape May City
0503	Cape May Point Borough
0504	Dennis Township
0505	Lower Township
0506	Middle Township
0507	North Wildwood City
0508	Ocean City
0509	Sea Isle City
0510	Stone Harbor Borough
0511	Upper Township
0512	West Cape May Borough
0513	West Wildwood Borough
0514	Wildwood City
0515	Wildwood Crest Borough
0516	Woodbine Borough
600	**Cumberland County**
0601	Bridgeton City
0602	Commercial Township
0603	Deerfield Township
0604	Downe Township
0605	Fairfield Township
0606	Greenwich Township
0607	Hopewell Township

0608	Lawrence Township
0609	Maurice River Township
0610	Millville City
0611	Shiloh Borough
0612	Stow Creek Township
0613	Upper Deerfield Township
0614	Vineland City
0700	**Essex County**
0701	Belleville Township
0702	Bloomfield Township
0703	Caldwell Borough Township
0704	Cedar Grove Township
0705	Ease Orange City
0706	Essex Fells Township
0707	Fairfield Township
0708	Glen Ridge Township
0709	Irvington Township
0710	Livingston Township
0711	Maplewood Township
0712	Millburn Township
0713	Montclair Township
0714	Newark City
0715	North Caldwell Township
0716	Nutley Township
0717	Orange City Township
0718	Roseland Borough
0719	South Orange Village Township
0720	Verona Township
0721	West Caldwell Township
0722	West Orange Township
0800	**Gloucester County**
0801	Clayton Borough
0802	Deptford Township
0803	East Greenwich Township
0804	Elk Township
0805	Franklin Township
0806	Glassboro Borough
0807	Greenwich Township
0808	Harrison Township
0809	Logan Township
0810	Mantua Township
0811	Monroe Township
0812	National Park Borough
0813	Newfield Borough
0814	Paulsboro Borough
0815	Pitman Borough
0816	South Harrison Township
0817	Swedesboro Borough
0818	Washington Township
0819	Wenonah Borough
0820	West Deptford Township

0821	Westville Borough
0822	Woodbury City
0823	Woodbury Heights Borough
0824	Woolwich Township
0900	**Hudson County**
0901	Bayonne City
0902	East Newark Borough
0903	Guttenberg Town
0904	Harrison Town
0905	Hoboken City
0906	Jersey City
0907	Kearny Town
0908	North Bergen Township
0909	Secaucus Town
0910	Union City
0911	Weehawken Township
0912	West New York Town
1000	**Hunderton County**
1001	Alexandria Township
1002	Bethlehem Township
1003	Bloomsbury Borough
1004	Califon Borough
1005	Clinton Town
1006	Clinton Township
1007	Delaware Township
1008	East Amwell Township
1009	Flemington Borough
1010	Franklin Township
1011	Frenchtown Borough
1012	Glen Gardner Borough
1013	Hampton Borough
1014	High Bridge Borough
1015	Holland Township
1016	Kingwood Township
1017	Lambertville City
1018	Lebanon Borough
1019	Lebanon Township
1020	Milford Borough
1021	Raritan Township
1022	Readington Township
1023	Stockton Borough
1024	Tewksbury Township
1025	Union Township
1026	West Amwell Township
1100	**Mercer County**
1101	East Windsor Township
1102	Ewing Township
1103	Hamilton Township
1104	Hightstown Borough
1105	Hopewell Borough
1106	Hopewell Township

1107	Lawrence Township
1108	Pennington Borough
1109	Princeton Borough
1110	Princeton Township
1111	Trenton City
1112	Washington Township
1113	West Windsor Township
1200	**Middlesex County**
1201	Carteret Borough
1202	Cranbury Township
1203	Dunellen Borough
1204	East Brunswick Township
1205	Edison Township
1206	Helmetta Borough
1207	Highland Park Borough
1208	Jamesburg Borough
1209	Metuchen Borough
1210	Middlesex Borough
1211	Milltown Borough
1212	Monroe Township
1213	New Brunswick City
1214	North Brunswick Township
1215	Old Bridge Township
1216	Perth Amboy City
1217	Piscataway Township
1218	Plainsboro Township
1219	Sayreville Borough
1220	South Amboy City
1221	South Brunswick Township
1222	South Plainfield Borough
1223	South River Borough
1224	Spotswood Borough
1225	Woodbridge Township
1300	**Monmouth County**
1301	Aberdeen Township
1302	Allenhurst Borough
1303	Allentown Borough
1304	Asbury Park City
1305	Atlantic Highlands Borough
1306	Avon By The Sea Borough
1307	Belmar Borough
1308	Bradley Beach Borough
1309	Brielle Borough
1310	Colts Neck Township
1311	Deal Borough
1312	Eatontown Borough
1313	Englishtown Borough
1314	Fair Haven Borough
1315	Farmingdale Borough
1316	Freehold Borough
1317	Freehold Township

1318	Hazlet Township
1319	Highlands Borough
1320	Holmdel Township
1321	Howell Township
1322	Interlaken Borough
1323	Keansburg Borough
1324	Keyport Borough
1325	Little Silver Borough
1326	Loch Arbour Village
1327	Long Branch City
1328	Manalapan Township
1329	Manasquan Borough
1330	Marlboro Township
1331	Matawan Borough
1332	Middletown Township
1333	Millstone Township
1334	Monmouth Beach Borough
1335	Neptune Township
1336	Neptune City Borough
1337	Ocean Township
1338	Oceanport Borough
1339	Red Bank Borough
1340	Roosevelt Borough
1341	Rumson Borough
1342	Sea Bright Borough
1343	Sea Girt Borough
1344	Shrewsbury Borough
1345	Shrewsbury Township
1346	South Belmar Borough
1347	Spring Lake Borough
1348	Spring Lake Heights Borough
1349	Tinton Falls Borough
1350	Union Beach Borough
1351	Upper Freehold Township
1352	Wall Township
1353	West Long Branch Boro
1400	**Morris County**
1401	Boonton Town
1402	Boonton Township
1403	Butler Borough
1404	Chatham Borough
1405	Chatham Township
1406	Chester Borough
1407	Chester Township
1408	Denville Township
1409	Dover Town
1410	East Hanover Township
1411	Florham Park Borough
1412	Hanover Township
1413	Harding Township
1414	Jefferson Township

1415	Kinnelon Borough
1416	Lincoln Park Borough
1417	Madison Borough
1418	Mendham Bourough
1419	Mendham Township
1420	Mine Hill Township
1421	Montville Township
1422	Morris Township
1423	Morris Plains Borough
1424	Morristown Town
1425	Mountain Lakes Borough
1426	Mt. Arlington Borough
1427	Mt. Olive Township
1428	Netcong Borough
1429	Parsippany-Troy Hills Township
1430	Long Hill Township
1431	Pequannock Township
1432	Randolph Township
1433	Riverdale Borough
1434	Rockaway Borough
1435	Rockaway Township
1436	Roxbury Township
1437	Victory Gardens Borough
1438	Washington Township
1439	Wharton Borough
1500	**Ocean County**
1501	Barnegat Township
1502	Barnegat Light Borough
1503	Bay Head Borough
1504	Beach Haven Borough
1505	Beachwood Borough
1506	Berkeley Township
1507	Brick Township
1508	Dover Township
1509	Eagleswood Township
1510	Harvey Cedars Borough
1511	Island Heights Borough
1512	Jackson Township
1513	Lacey Township
1514	Lakehurst Borough
1515	Lakewood Township
1516	Lavalette Borough
1517	Little Egg Harbor Township
1518	Long Beach Township
1519	Manchester Township
1520	Mantoloking Borough
1521	Ocean Township
1522	Ocean Gate Borough
1523	Pine Beach Borough
1524	Plumsted Township
1525	Point Pleasant Borough

1526	Point Pleasant Beach Borough
1527	Seaside Heights Borough
1528	Seaside Park Borough
1529	Ship Bottom Borough
1530	South Toms River Borough
1531	Stafford Township
1532	Surf City Borough
1533	Tuckerton Borough
1600	**Passaic County**
1601	Bloomingdale Borough
1602	Clifton City
1603	Haledon Borough
1604	Hawthorne Borough
1605	Little Falls Township
1606	North Haledon Borough
1607	Passaic City
1608	Paterson City
1609	Pompton Lakes Borough
1610	Prospect Park Borough
1611	Ringwood Borough
1612	Totowa Borough
1613	Wanaque Borough
1614	Wayne Township
1615	West Milford Township
1616	West Paterson Borough
1700	**Salem County**
1701	Alloway Township
1702	Carneys Point Township
1703	Elmer Borough
1704	Elsinboro Township
1705	Lower Alloways Crk. Township
1706	ManningtonTownship
1707	Oldsman Township
1708	Penns Grove Borough
1709	Pennsville Township
1710	Pilesgrove Township
1711	Pittsgrove Township
1712	Quinton Township
1713	Salem Township
1714	Upper Pittsgrove Township
1715	Woodstown Borough
1800	**Somerset County**
1801	Bedminster Township
1802	Benards Township
1803	Benardsville Borough
1804	Bound Brook Borough
1805	Branchburg Township
1806	Bridgewater Township
1807	Far Hills Borough
1808	Franklin Township
1809	Green Brook Twonship

1810	Hillsborough Township
1811	Manville Borough
1812	Millstone Borough
1813	Montgomery Township
1814	North Plainfield Borough
1815	Peapack-Gladstone Borough
1816	Raritan Borough
1817	Rocky Hill Borough
1818	Somerville Borough
1819	South Bound Brook Borough
1820	Warren Township
1821	Watchung Borough
1900	**Sussex County**
1901	Andover Borough
1902	Andover Township
1903	Branchville Borough
1904	Byram Township
1905	Frankford Township
1906	Franklin Borough
1907	Fredon Township
1908	Green Township
1909	Hamburg Borough
1910	Hampton Township
1911	Hardyston Township
1912	Hopatcong Borough
1913	Lafayette Township
1914	Montague Township
1915	Newton Town
1916	Ogdensburg Borough
1917	Sandyston Township
1918	Sparta Township
1919	Stanhope Borough
1920	Stillwater Township
1921	Sussex Borough
1922	Vernon Township
1923	Walpack Township
1924	Wantage Township
2000	**Union County**
2001	Berkeley Heights Township
2002	Clark Township
2003	Cranford Township
2004	Elizabeth City
2005	Fanwood Borough
2006	Garwood Borough
2007	Hillside Township
2008	Kenilworth Borough
2009	Linden City
2010	Mountainside Borough
2011	New Providence Borough
2012	Plainfield City
2013	Rahway City

2014	Roselle Borough
2015	Roselle Park Borough
2016	Scotch Plains Township
2017	Spingfield Township
2018	Summit City
2019	Union Township
2020	Westfield Town
2021	Winfield Township
2100	**Warren County**
2101	Allamuchy Township
2102	Alpha Borough
2103	Belvidere Town
2104	Blairstown Township
2105	Franklin Township
2106	Frelinghuysen Township
2107	Greenwich Township
2108	Hackettstown Town
2109	HardwickTownship
2110	Harmony Township
2111	Hope Township
2112	Independence Township
2113	Knowlton Township
2114	Liberty Township
2115	Lopatcong Township
2116	Mansfield Township
2117	Oxford Township
2119	Phillipsburg Town
2120	Pohatcong Township
2121	Washington Borough
2122	Washington Township
2123	White Township

4.2.3 Classification of Work - Bridge Items

CLASS Code	Type of Work
SHEE	Sheeting
BDST	Clearing site, bridge
COCU	Concrete culverts
PILE	Piles
WALL	Noise Barrier
BRST	Temporary Shielding
COFF	Cofferdams
REIN	Reinforcing Steel
TEST	Temporary Structure
DECK	Deck Repair
CONS	Structural Concrete
DIVE	Underwater Inspection
STEL	Structural Steel
PREC	Precast/Prestressed Beams

OSIG	Overhead/Cantilever signs
BEXC	Bridge Excavation
BMIC	Bridge Miscellaneous (Fence, railing, joints, guiderail etc.)

4.2.4 Classification of Work - Road Items

CLASS Code	**Type of Work**
CLER	Clearing site items
DRAN	Drainage items
EART	Earthwork items
PAVE	Asphalt Pavement items
LAND	Landscape items
UTIL	Utility items
MISC	Miscellaneous items
ELEC	Electrical and Signal items
CURB	Curb items
MAIN	Maintenance of traffic items
LTSD	Traffic stripes, signs and delineators
AGGR	Aggregates (Subbase, DGABC, etc.)
ITSW	ITS Work
CONC	Concrete Pavement
DEMO	Demolition
ENVR	Environmental
MILL	Milling
SLAB	Approach and Transition Slabs
RCSC	Removal of Concrete Base and Roadway
RDST	Removal of curb
WALK	Sidewalks and Driveways
THLS	Temporary Lighting
FENC	Fence
BRAL	Beam Guide Rail

4.3 AREP Project Area

Values of YYYY will be the name of the project and the last two places are user defined.

Value	Used Defined
YYYYA1	Area 1 (Description to be defined by user)
YYYYA2	Area 2 (Description to be defined by user)
YYYYA3	Area 3 (Description to be defined by user)
YYYYA4	Area 4 (Description to be defined by user)
YYYYA5	Area 5 (Description to be defined by user)
YYYYA6	Area 6 (Description to be defined by user)
YYYYA7	Area 7 (Description to defined by user)
YYYYA8	Area 8 (Description to be defined by user)
YYYYA9	Area 9 (Description to be defined by user)
YYYYB1	Area 10 (Description to be defined by user)

5.0 Standard Factors

Designers will take into account the following factors when preparing a Construction Schedule:

- Determine the optimum time to advertise a project, so as to minimize the impacts of seasonal restrictions and thus reduce the overall length of a project's duration. When possible, schedule the advertisement of a project to allow construction to be completed in a single construction season.
- Seasonal limitations on work such as concrete construction, HMA paving (especially if restricted to night hours), HMA availability, curb, traffic stripes, landscaping and bridge painting.
- Utility relocation's. Treat each utility separately - work on the same pole line must be treated sequentially, not concurrently.
- No natural gas service interruptions during the winter months (Normally from October 1 to April 1). Confirm dates with Capital Program Support.
- No water service interruptions during the summer months (Normally from April 1 to September 30). Confirm dates with Capital Program Support.
- No electrical services interruptions during the summer months. Normally from June 1 through Sept 30 should not be considered for electric outages. This is not only for transmission lines but also distribution lines.
- Special interruptions of utility services. Utility company customers may restrict when services can be interrupted. This is particularly true with manufacturing customers, and financial service customers.
- Railroad access restrictions. This should account for how often the RR will likely grant a track outage or other access in a given week, and also for the impacts on contractor productivity.
- Right-of-way availability (each parcel treated separately).
- Construction easement restrictions.
- Work hour restrictions due to staging and traffic volumes.
- Marine, bridge openings, or railroad traffic.
- Staged construction.
- Allowable lane closures along shore routes. These may not be closed from Memorial Day weekend through Labor Day.
- Concrete curing time.
- Embankment settlement time.
- Coordination with other projects.

- When non-standard concrete or HMA materials are specified, time necessary to perform material mix design approvals.
- Working drawing preparation, submission and approvals (each one treated separately).
- Availability, fabrication and delivery of materials. This includes an analysis of any "Buy America/Buy American" requirements. [FHWA approval of a Buy America waiver will take a minimum of 6 months. FHWA will not approve a waiver for Buy America, solely because of the impact to the project schedule from obtaining material from a domestic source].
- Permit restrictions (fish spawning, etc.).
- Work area restrictions (wetlands, historic sites, parkland, etc.).
- Hazardous material excavation and disposal.
- Payment restrictions due to limits in multi-year funding.
- Work restrictions due to local activities, holiday seasons on roads with shopping centers, or in seasonal areas such as shore communities.
- Impacts to Authorities. (i.e. NJ Turnpike, NJ Highway Authority, South Jersey Transportation Authority etc.)
- ITS testing
- The time between substantial completion and completion accounts for likely corrective action and the seasonal restrictions that may apply to such work.
- The duration between Substantial Completion to Completion must be 60 days for projects less than 50 Million and 90 days for projects greater than 50 Million.
- Substantial Completion and Completion dates will not be established between December 1st to March 15th for projects North of Route 195, and December 15th to March 1st for projects South of Route 195, including Route 195. Every reasonable method (e.g. multiple crews, extended work hours etc.) is to be used to avoid this December to March period.
- If a Completion date prior to December cannot be achieved, the duration between Substantial Completion and Completion does not include the days between December and March, See below Table A for resume work date.

Table A:

LOCATION	**Stop Day Count**	**Resume Day Count**
Projects NORTH of Route 195	December 01	March 15
Projects SOUTH of Route 195, Including Route 195	December 15	March 01

6.0 Level of Detail Required on a Construction Schedule

The schedule will include, as a minimum, one activity for each discrete component part of each Item scheduled in the Proposal. The Department may allow grouping of similar Items.

Utility relocations must show the impacts for each stage (if applicable). It is not sufficient to simply show the utility company's duration for notice and the duration for the entire relocation work. The schedule must show the need for providing multiple notices, when stage work interrupts the sequence of relocation work, and the impacts of the relocation work to each stage of the contractor's work.

7.0 Designer Contract Time Determination

A Construction progress schedule establishes a completion date that provides the **shortest practical duration** of construction to minimize disruption of traffic but still allows the contractor a reasonable amount of time to complete the work at a reasonable cost. Tables A through D, Contractor Production Rates, are to be used **as a guide** to determine the construction schedule.

A detailed breakdown of the bridge items and road items is needed on the Construction progress schedule. This is necessary to determine if increased production rates or additional crews are required to meet a desired completion date. Where ranges of production rates are shown, the lower rates are for two-lane bridges and the higher rates are for bridges with more than two lanes. The Designer will also take into account the complexity of the work, fabrication time, the site conditions, traffic effects and all other factors when choosing a production rate.

In Appendix B there is a chart showing the number of days lost per month for weather sensitive activities for roadway (R) and bridge (B). The number of days lost per month for roadway and bridgework is to be adjusted upward in the northern part of the State, and adjusted downward in the southern part of the State. If weekend work is required, the total number of workdays per month must be adjusted. If a different number of working days is used, the Designer is to provide a written explanation with the Construction Progress Schedule. The Designer will also look at the types and classes of work performed during the winter season. Adjustments are to be made based on whether work can be performed during this time frame.

The full width of the traveled way and shoulders should be open to traffic whenever conditions permit during a winter shutdown. Consideration is to be given to setting interim completion dates for stages of construction and for portions of the work that significantly affect traffic.

7.1 Risk Assessed Progress Schedule Duration

The Project Manager may require the designer to provide a risk assessed Construction Schedule, using schedule risk analysis.

7.2 Final Submission

Construction progress schedules are prepared and submitted by the Designer with the final design submission. Distribution of the construction progress schedules is as follows:

<table>
<tr><th>Group</th><th>Hard Copy</th><th>Electronic</th></tr>
<tr><td>Project Manager</td><td>X</td><td>X</td></tr>
<tr><td>Bureau of Construction Management</td><td>X</td><td>X</td></tr>
<tr><td>Quality Management Services</td><td>X</td><td>X</td></tr>
<tr><td>Traffic Engineering</td><td>X</td><td></td></tr>
<tr><td>FHWA (Full oversight projects)</td><td>X</td><td></td></tr>
<tr><td>Division Of Civil Rights and Affirmative Action
(when Trainees are being requested)</td><td>X</td><td></td></tr>
<tr><td>Structural Design & Geotechnical Engineering</td><td colspan="2" rowspan="6">Copies are available upon request from the PM</td></tr>
<tr><td>Geometric Design – Pavements</td></tr>
<tr><td>Landscape</td></tr>
<tr><td>Utilities</td></tr>
<tr><td>Right of Way</td></tr>
</table>

Increased production rates may require the use of multiple crews and/or overtime. This additional cost is to be reflected in the Construction Cost Estimate.

7.3 Designer Standard Naming of Projects

The Designer is to assign a four-character file name. The first two characters will be the project identifier. The last two digits will be as follows:

- I0 - Design submission
- I1 - Design submission
- revised Etc.
- F1 - Final submission
- F2 - Final submission
- revised Etc.

The type of each submission must be clearly labeled in the description field.

7.4 Multi - Year Funding

If during development of the Capital Program it is determined that a project may need to be multi-year funded, the Project Manager will provide to the Capital Program Development a breakdown of the estimated construction cost per fiscal year based on the construction staging of the project. The Designer is responsible for developing a cost loaded CPM including the cost breakdown by activity and year.

7.5 Determining Start of Construction:

From Final Design Submission to Plans, Specifications and Estimate (PS&E) Submission - is approximately 12 weeks**.** Add 4 weeks for FHWA full oversight funded projects to allow for Preliminary PS&E review. Additional time may be considered for review and revisions on larger projects and / or projects with outstanding issues at the Final Design Submissions (FDS) (permits, ROW, utilities, etc.).

From PS&E Submission to Advertisement - 3 weeks for 100 percent State funded projects, 4 weeks for FHWA alternate procedure (NHS or non-NHS projects, and 5 weeks for other federally funded projects.

From Advertising to Receipt of Bids – A minimum of 3 weeks is required for bidding, with additional time allowed for larger or complex projects. *

From Receipt of Bids to Award – 15 State Business Days. **

From Award to Construction - Award to Execution of the Contract will vary up to 55 State Business Days. The construction start date of the CPM Schedule is the Contract Start Date (25 calendar days after the execution of the Contract.) **

From Award to Construction:

The successful bidder has 14 days to sign the Contract and return it along with the required Performance & Payment Bond. The Commissioner has up to 60 days after receiving it to execute the Contract

Award to Execution of the Contract can vary up to 74 days. Therefore, a minimum of 74 days* is the template duration to be shown on the Schedule for Administrative Activity A300.

As per the Standard Specifications, Commencement of Work is to begin within 25 days of Contract execution. Therefore, the Construction Start Date (Milestone activity M500) shown on the Contractors Baseline Schedule is 25 days* from the execution date of the Contract.

*In general, shorter time frames are appropriate for 100 percent State funded projects.

****** The Bureau of Construction Management should be consulted by the Project Manager to verify that the time frames used by the Designer are appropriate.

7.6 Table A

Production Rates For Roadway Items

ITEM	Type 1 Construction	Type 2 Reconstruction	Type 3 Widening	Type 4 Resurfacing	Type 5 Intersections
Mobilization	10 Days*	10 Days*	5 Days	2 Days	2 Days
Clearing Site	4 Acres	4 Acres	4 Acres	N/A	N/A
Stripping	2 Acres	2 Acres	1 Acres		
Demolition of Buildings	1 Unit	1 Unit	1 Unit	N/A	N/A
Pest Control	10 Days	10 Days	10 Days	N/A	N/A
Asbestos Clean-up Resident and Small Commercial Large Commercial	4 Days 10 Days	4 Days 10 Days	4 Days 10 Days	N/A	N/A
Pavement Removal	N/A	2250 SY	2250 SY	2500 SY	300 SY
Roadway Excavation	3000 CY	1000 CY	1000 CY	N/A	N/A
Embankment	1500 CY	350 CY	350 CY	N/A	N/A
Drainage Pipe Includes 1 Structure 36 inches and Smaller Larger than 36 inches	300 LF 100 LF	150 LF 60 LF	150 LF 60 LF	N/A N/A	150 LF 60 LF
Reset Castings	N/A	5 Units	5 Units	5 Units	5 Units
Extension Frames, Rings and Grates	N/A	12 Units	12 Units	12 Units	12 Units
Subbase	350 CY	250 CY	150 CY	N/A	50 CY
Aggregate Base Course	350 CY	250 CY	150 CY	N/A	50 CY
HMA	1500 TONS	1000 TONS	750 TONS	1300 TONS	250 TONS
Concrete Base or Surface Course	2500 SY	1000 SY	750 SY	N/A	225 SY

Note: Production Rates are based on 8-hour working day per crew.

TYPE 1 = New construction, additions or major reconstruction of divided or undivided highways.

TYPE 2 = Reconstruction or upgrading existing highways.

TYPE 3 = Widening (less than one lane) and resurfacing existing highways.

TYPE 4 = Resurfacing existing highways with bituminous concrete.

TYPE 5 = Minor construction or reconstruction of street or highway intersections.

***** = Use 20 days when $20 million or higher.

Table A (Con't) - Production Rates For Roadway Items

ITEM	Type 1 Construction	Type 2 Reconstruction	Type 3 Widening	Type 4 Resurfacing	Type 5 Intersections
Concrete Bridge Approach	200 SY	200 SY	200 SY	N/A	N/A
Milling (up to 2 inches thick)	N/A	6000 SY	6000 SY	6000 SY	2500 SY
Concrete Barrier Curb	400 LF	350 LF	350 LF	250 LF	N/A
Concrete Vertical Curb	500 LF	400 LF	400 LF	300 LF	200 LF
Concrete Sidewalk	225 SY	200 SY	200 SY	150 SY	150 SY
Electrical Conduit	600 LF	400 LF	400 LF	150 LF	150 LF
Fiber Optic Conduit	1000 LF	1000 LF	1000 LF	1000 LF	N/A
Electrical Wire	1200 LF	1200 LF	1200 LF	300 LF	300 LF
Lighting Standards	4 Unit	4 Unit	4 Unit	N/A	4 Unit
Traffic Signal Installation (1)	20 Days per Intersection	20 Days per Intersection	20 Days per Intersection	20 Days per Intersection	20 Days per Intersection
Reset Beam Guide Rail	N/A	500 LF	500 LF	400 LF	N/A
Beam Guide Rail	750 LF	750 LF	750 LF	500 LF	N/A
Chain Link Fence	400 LF	400 LF	400 LF	N/A	N/A
Overhead Sign Structure (2)	15 Days per Structure	15 Days per Structure	15 Days per Structure	15 Days per Structure	N/A
Landscaping, Turf	10,000 SY	10,000 SY	10,000 SY	N/A	N/A
Landscape, Planting (3)	Planting Season	Planting Season	Planting Season	Planting Season	N/A
Final Acceptance (4)	60 Calendar Days	60 Calendar Days	60 Calendar Days	60 Calendar Days	60 Calendar Days

Note: Production Rates are based on 8-hour working day per crew. (1) Manufacturing and delivery of steel traffic signal poles requires 4 months, aluminum lighting and traffic signal poles require 2 months and traffic signal controllers require 4 months.

(2) Allow 2 months for working drawing approval, fabrication and delivery.

(3) Optimal Planting seasons - from March 1 to May 15 and from August 15 to December 1.

(4) These are minimum time frames.

7.6 Table B

Production Rates For Bridge Items

ITEM	Type 1 Construction	Type 2 Reconstruction	Type 3 Superstructure	Type 4 Deck	Type 5 Overlay
Cofferdams	20 days	20 days	N/A	N/A	N/A
Retaining Walls (1,3) (Cast-in-Place)	20 days / 100 LF	20 days/ 100 LF	N/A	N/A	N/A
Retaining Walls (MSE etc)	15 days / 100 LF	15 days / 100 LF	MA	NA	NA
Box Culverts (Cast-in-Place)	10 days / 30 LF	10 days / 30 LF	N/A	N/A	N/A
Box Culverts (2) (Precast)	5 days / 30 LF	5 days / 30 LF	N/A	N/A	N/A

Notes:

Production Rates are based on 8-hour working day per crew.

For two bridges add 50%, for each additional bridge add

25%.

For Stage Construction, consider each stage to be a separate bridge.

For bridges over water or railroads add 30 days, except for Type 5 for which no adjustment is necessary.

Production rates include the time required for concrete curing.

(1) Add 5 days per 100 LF if temporary sheeting is required.

(2) Includes excavation and placing, allow 3-4 months for working drawing approval, fabrication and delivery.

(3) Use for Reinforced Earth, Double Wall and Anchored Walls.

Type 1 = New Construction on new alignment.

Type 2 = Remove existing bridge and construct new bridge at same location.

Type 3 = Replace deck and beams including minor substructure repair.

Type 4 = Replace deck.

Type 5 = Deck patching and LMC overlay (subtract 10 days if overlay is bituminous concrete).

7.6 Table C

Bridge Item Production Rates on a One Span Bridge (40 to 100 feet Range)

Bridge Type/Bridge Item	Type 1	2	3	4	5
	New on New Alignment	New on Same Alignment	Superstructure Replacement	Deck Replacement	B, C & LMC
Demolition	--	16-28 days	8-16 days	7-14 days	--
Foundation Excavation	2-4 days	2-4 days	--	--	--
Piles	4-6 days	4-6 days	--	--	--
Footing	2-4 days	2-4 days	--	--	--
Abutment, Pier, & WW's	6-8 days	6-8 days	--	--	--
Substructure Curing Framing	14 days 2-4 days	14 days 2-4 days	-- 2-4 days	-- --	-- --
Deck Joints	2-4 days	2-4 days	2-4 days	2-4 days	2-4 days
Deck Forms	7-12 days	7-12 days	7-12 days	7-12 days	--
Shear Connectors	1-2 days	1-2 days	1-2 days	1-2 days	--
Deck	2-4 days	2-4 days	2-4 days	2-4 days	--
Deck Slab Curing Header	14 days 1-2 days	14 days 1-2 days	14 days 1-2 days	14 days 1-2 days	-- --
Parapets	2 days	2 days	2 days	2 days	--
Preformed Joint	1 day	1 day	1 day	1 day	1 day
Railing/Fence	3 days	3 days	3 days	3 days	--
Sawcut Deck	1 day	1 day	1 day	1 day	1 day
Substructure Rehabilitation	--	--	6-12 days	2-4 days	--
Deck Repairs	--	--	--	--	6-12 days
Total	64-85 days	80-113 days	50-77 days	43-63 days	26-36 days

Allow 2 months (steel beams) and 3 months (concrete beams) for working drawing approval, fabrication and delivery. Designer will verify anticipated timeframes prior to Final Submission.

7.6 Table D

Bridge Item Production Rates on a Two Span Bridge (180 to 200 feet Range)

Bridge Type/Bridge Item	Type 1	2	3	4	5
	New on New Alignment	New on Same Alignment	Superstructure Replacement	Deck replacement	B, C & LMC
Demolition	--	26-48 days	16-32 days	14-28 days	--
Foundation Excavation	3-5 days	3-5 days	--	--	--
Piles	6-10 days	6-10 days	--	--	--
Footing	4-8 days	4-8 days	--	--	--
Abutment, Pier, & WW's	9-13 days	9-13 days	--	--	--
Substructure Curing Framing	14 days 4-8 days	14 days 4-8 days	-- 4-8 days	-- --	-- --
Deck Joints	3-6 days	3-6 days	3-6 days	3-6 days	3-6 days
Deck Forms	14-24 days	14-24 days	14-24 days	14-24 days	--
Shear Connectors	2-4 days	2-4 days	2-4 days	2-4 days	--
Deck	4-8 days	4-8 days	4-8 days	4-8 days	--
Deck Slab Curing Header	14 days 1-2 days	14 days 1-2 days	14 days 1-2 days	14 days 1-2 days	-- --
Preformed Joint	2 days	2 days	2 days	2 days	2 days
Parapets	4 days	4 days	4 days	4 days	--
Railing/Fence	6 days	6 days	6 days	6 days	--
Sawcut Deck	1-2 days	1-2 days	1-2 days	1-2 days	1-2 days
Substructure Rehabilitation	--	--	9-18 days	3-6 days	--
Deck Repairs	--	--	--	--	12-24 days
Working Drawing Approval	45	45	45	45	45
TOTAL	91-130 days	117-178 days	80-130 days	68-106 days	36-56 days

7.7 Acceleration of Construction Schedules

To reduce construction time to lessen the impact on the traveling public and the community where the highway construction is scheduled, the following methods may be considered:

- Increased Production Rates
- Incentive/Disincentive (I/D)
- A+B Bidding

The acceleration of project schedules may be warranted when:

- There is high road user cost as calculated in accordance with the *Road User Cost Manual* resulting from delays or diversions from construction activity.
- There are seasonal requirements on highways leading to points of recreational interest, resort areas, vacation areas, regional retail centers, major public facilities, etc.
- The work involves significant impact on the community such as the need for night work, detours, and disruption to public transit, etc.
- The project is of an emergency nature or is required to meet a critical safety need.
- It is essential the project be completed to allow for a specific opening date or construction of adjacent projects.
- There is a significant reduction in user delays after construction is completed.
- The construction schedule can be reduced to the nearest full construction season.

In addition, the following conditions must be met if acceleration of the project schedule is to be considered:

- R.O.W. availability, utility agreements and permits will be available/completed by the advertisement date.
- Sufficient project funding is available on multiyear funded projects.
- Railroad work is not involved.
- The benefits of accelerating the project outweigh the additional construction costs.
- Local community involvement

When accelerating project schedules, in addition to the progress schedule for normal times and rates, a second progress schedule will be prepared reflecting the accelerated schedule and rates that shows the work being achieved by the accelerated completion date.

7.8 Increased Production Rates

To reduce the duration of a project, increased production rates may be used. Increased production rates may be obtained by assuming the use of multiple crews, multiple shifts, and/or overtime. Such assumptions are not always practical, and should be only be used with the concurrence of the Bureau of Construction Management. If longer than 8-hour day and or accelerated production rates are used, the Designer must submit an explanation with the construction schedule. Increased production rate will usually result in an increased estimated cost for the project, and Designer will account for and explain the cost impact with the Construction Cost Estimate.

A production rate of **1.20** times the Designer's established standard production rate will be utilized to establish the completion date for accelerated projects. The designer will analyze the staging and work areas of the project to ensure the increased production rates do not apply to confine areas where the rate would not be achievable.

7.9 Designer Narrative

The Designer will submit a written narrative with each submission of a Progress Schedule. Included in this narrative will be:

- Anticipated production rates
- Anticipated workforce (i.e. number of crews, size, crew type etc.)
- Anticipated work during the Winter Season (December through March inclusive) and the number of workdays for Bridge and Roadwork.
- Permit requirements
- Utility requirements
- ROW requirements
- Community commitments
- Lead time for special materials
- Detours and anticipated timeframe
- Any critical milestones (i.e. road/ramp openings, critical stages etc.)
- Any anticipated problems meeting the schedule (ROW, Utilities etc.)
- Description of any acceleration applied to the project's schedule
- If the time period between Substantial and Completion is extended through December to March (see 5.0 Standard Factors), describe the reason why. Use every reasonable method to avoid extending the contract through December to March (e.g. multiple crews, extended work hours etc.)

The number of restricted working days for each operation as shown in Appendix B.

8.0 Contractor Procedure

8.1 Contractor Standard Naming of Projects

For projects under 1 year in duration, the contractor will assign a four-character file name. The first three characters will be the project identifier. The last digit will be as follows:

- 0 will be the working schedule
- 1 - Baseline 1
- 2 - Baseline 2 etc.
- A - First update
- B - Second update etc.

For projects over 1 year in duration, the contractor will assign a four-character file name. The first two characters will be the project identifier. The last two digits will be as follows:

- 00 will be the working schedule
- 01 - Baseline 1
- 02 - Baseline 2 etc.
- AA - First update
- AB - Second update etc.
- BA - 27th update
- Working Schedule = XXX0

8.2 Time Impact Evaluation (TIE)

The Contractor is required to provide a Time Impact Evaluation (TIE) Form DC-186 if the Contractor proposes that an impact has delayed the Contractor and additional Contract Time is proposed to be necessary by the Contractor.

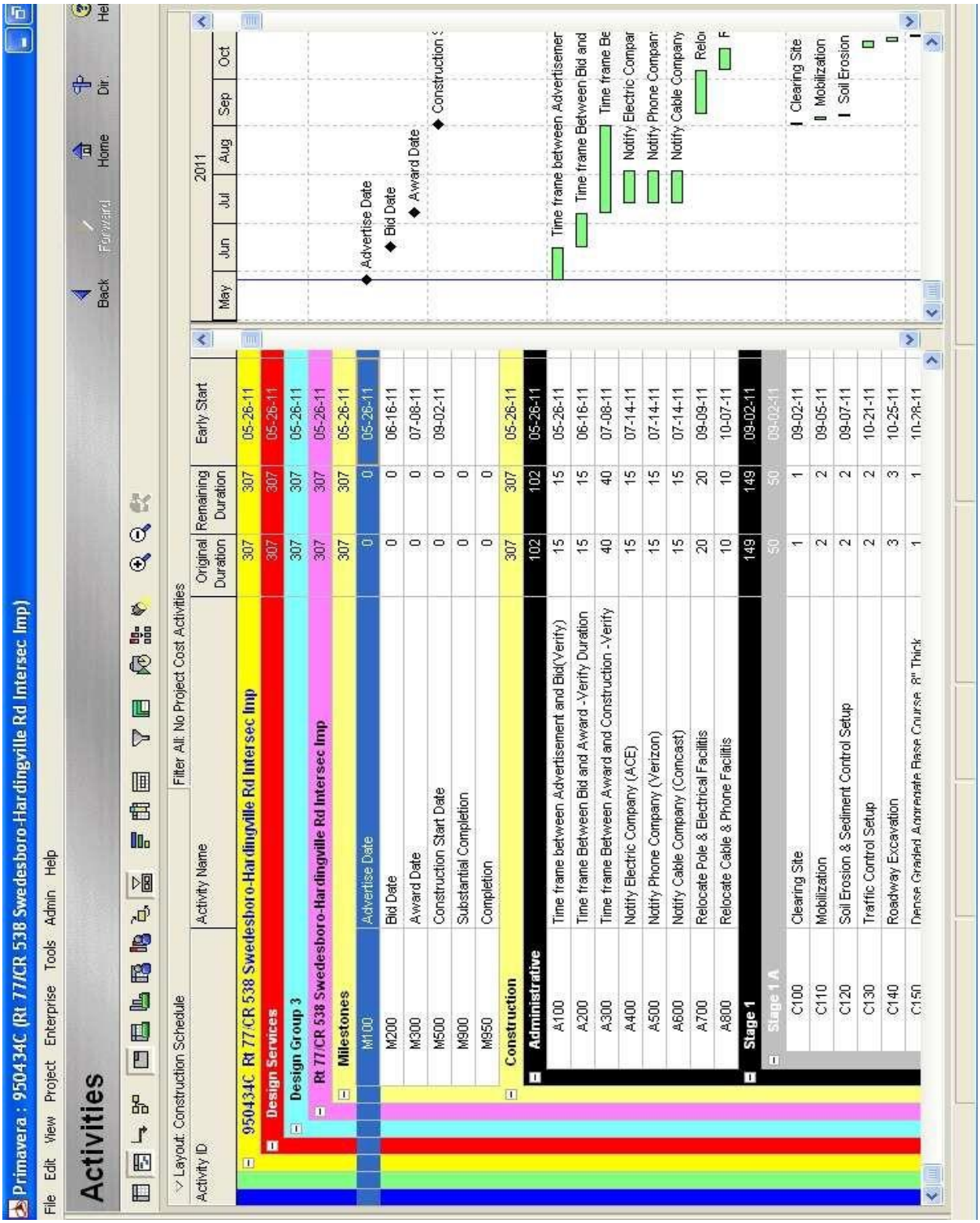
The TIE Form DC-186 requires the submission of fragnet. The fragnet models the impact to the schedule. The fragnet should consist of a subset of the activities in the project schedule that were involved directly with the delay. The delay should be described as simply as possible with the fewest number of activities and relationships added in order to

substantially reflect the impact of the delay to the schedule. Existing relationships and activities should be left intact wherever passable. It is expected that the added relationships will cause some of the existing relationships to become redundant to the CPM calculation but relationships should only be deleted where the retention of that relationship would negate the actual work restraints on the project. It is acceptable to add a delay as a successor to an activity when in fact, that delay occurred during the activity and delayed its completion. It is also acceptable to break the existing delayed activity into two activities, with one representing the planned work before the delay and the other the planned work after the delay as long as the combined durations of the split activities equals the original duration of the activity.

The RE should review, negotiate (if necessary,) and approve the fragnet before proceeding with the further review of the schedule.

Appendix D provides sample TIEs.

Appendix A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Activities
Back Forward Home Dir.
Layout: Construction Schedule
Filter All: No Project Cost Activities
Activity ID
Activity Name
Original Duration
Remaining Duration
Early Start
2011
May Jun Jul Aug Sep Oct
950434C Rt 77/CR 538 Swedesboro-Hardingville Rd Intersec Imp 307 307 05-26-11
Design Services 307 307 05-26-11
Design Group 3 307 307 05-26-11
Rt 77/CR 538 Swedesboro-Hardingville Rd Intersec Imp 307 307 05-26-11
Milestones 307 307 05-26-11
M100 Advertise Date 0 0 05-26-11
M200 Bid Date 0 0 06-16-11
M300 Award Date 0 0 07-08-11
M500 Construction Start Date 0 0 09-02-11
M900 Substantial Completion 0 0
M950 Completion 0 0
Construction 307 307 05-26-11
Administrative 102 102 05-26-11
A100 Time frame between Advertisement and Bid(Verify) 15 15 05-26-11
A200 Time frame Between Bid and Award -Verify Duration 15 15 06-16-11
A300 Time frame Between Award and Construction -Verify 40 40 07-08-11
A400 Notify Electric Company (ACE) 15 15 07-14-11
A500 Notify Phone Company (Verizon) 15 15 07-14-11
A600 Notify Cable Company (Comcast) 15 15 07-14-11
A700 Relocate Pole & Electrical Facilitis 20 20 09-09-11
A800 Relocate Cable & Phone Facilitis 10 10 10-07-11
Stage 1 149 149 09-02-11
Stage 1 A 50 50 09-02-11
C100 Clearing Site 1 1 09-02-11
C110 Mobilization 2 2 09-05-11
C120 Soil Erosion & Sediment Control Setup 2 2 09-07-11
C130 Traffic Control Setup 2 2 10-21-11
C140 Roadway Excavation 3 3 10-25-11
C150 Dense Graded Aggregate Base Course, 8" Thick 1 1 10-28-11
Advertise Date
Bid Date
Award Date
Construction
Time frame between Advertisemer
Time frame Between Bid and
Time frame Be
Notify Electric Compar
Notify Phone Compan
Notify Cable Company
Relo
F
Clearing Site
Mobilization
Soil Erosion

Appendix B

Anticipated Number of Days Lost per Month for Weather Sensitive Activities (Contract Time Determination only)

Month	Roadwork	Bridgework
January	31	20 *
February	28**	20*
March	20	20
April	15	15
May	10	10
June	10	10
July	10	10
August	10	10
September	10	10
October	15	15
November	15	15
December	20	20

*For concrete placement Items, as described in Division 500, other than CONCRETE BRIDGE APPROACH, the number of days restricted is 20

**For Leap years the number of days restricted is 29

Appendix C

Procedure for using the Construction Scheduling Template containing Standard Coding for Designers and Contractors

C.1 The file is a "Back Up" of a Template to be utilized by Designers and Contractors. The file can be accessed utilizing Primavera P6.

C.2 The project is to be "Restored" to a suitable folder within your computer system from which you will create the schedule. Naming and coding of the project is to be in accordance with the Capital Program Management Construction Scheduling Standard Coding and Procedures for Designers and Contractors.

C.3 Contained in this Template are the following:

C.3.1 Work Breakdown Structure (WBS) (**Each activity** in the schedule will be assigned to the appropriate WBS element)

C.3.1.1 Milestone Activities:

- Milestones M100, M200, M300, M500, M900, M950 is to be utilized for every project. M700 is to be utilized if an interim date will be or is part of the Contract (expand for other milestones).
- If a Milestone activity will not be or is not part of the Contract – it is to be deleted for that project.
- Milestone Activity numbers and Descriptions are not to be changed except for Intermediate Milestones for Stages, Interim Completion dates and ROW availability dates.

C3.1.2 Construction

- Construction is broken down by stage and then by area
- Stages were developed using 1, 2, 3 etc then further broken down 1A, 1B, 1C etc. (i.e. Use Stage 1 for Stage 1 Activities, Use Stage1A for Stage 1A activities etc.)
- Areas are user defined and coding is to be utilized as shown in the Capital Program Management Construction Scheduling Standard Coding and Procedures for Designers and Contractors.

C3.1.3 Procurement: Procurement WBS is utilized for **all** submission and procurement activities.

C3.2 Design (Design/Build only)

- This can be deleted if it is not a Design/Build project

C.4 Activities: Each activity will begin with an alpha character. The character is user assigned.

- Each activity will be assigned (as a minimum) a WBS structure, responsibility, project area, class of work, type of work and calendar.

C.5 Calendars: The following calendars are given in the template:

- State Business Days
- Deciduous trees
- Broad leaf trees
- 7 Day work week

They are not to be changed in any way or deleted. Calendars can be added as determined by the user.

Direct questions or problems with the template to Construction Management.

Appendix D

Sample 1 Time Impact Evaluation (TIE) - Form DC-186

NEW JERSEY DEPARTMENT OF TRANSPORTATION

TIME IMPACT EVALUATION (TIE)

PROJECT: Route 40 and Cologne Ave TIE # 1

PREPARED BY: Lea Volturo DATE: 7/20/2012

DESCRIPTION: The reason for the extension of time is that on the Route 40 and Cologne Ave Intersection Improvements Project for Hamilton Township Municipal Utilities Authority (HTMUA) requested a change of plans for the sewer work South State was to complete. The initial contract proposed the relocation of the HTMUA's 6" and 8" DIP force mains on Route 40 Eastbound from station 507+00 to 511+70. By the time the project went to bid, the HTMUA required revisions to eliminate these force main relocations and instead, construct a bored crossing to redirect the two force mains to the HTMUA's existing 24" interceptor.

These revisions required work on the opposite side of Route 40, the westbound side. With this location change, the Pinelands permit had to be resubmitted which took 26 days for approval.

ACTIVITIES AFFECTED: Traffic signal work, stage change, grading and paving

TYPE OF IMPACT: Inability to continue project work due to delay of sewer required to be completed prior to stage change.

INCREASED DURATION: 26 days AMOUNT: n/a

DELAYED DATE/SUSPENSION OF WORK: June 16, 2011 to July 12, 2011

FRAGNET:

*The HTMUA change of plans prevented the installation of the 6" & 8" sewer mains until July 12, 2011 therefore delaying the gas relocation, utility pole relocation, the subbase, the DGA, etc.

EVALUATION/RESPONSIBILITY: On June 16, 2011 the HTMUA submitted their request for a change in utility work. This was forwarded to the contractor to compute a price and on June 23, 2011 the contractor returned with a price lower than the original work. With this, the change of plans was approved by the Resident Engineer, Field Manager and Project Manager but in order to complete the work a new Pinelands Permit was needed which was not approved until July 12, 2011. Because of the costs and the improvements in the plans, an extension of time was granted to the contractor of 26 days.

Sample 2 Time Impact Evaluation (TIE) - Form DC-186

Form DC-186 8/03

NEW JERSEY DEPARTMENT OF TRANSPORTATION

TIME IMPACT EVALUATION (TIE)

TIE # 1

PROJECT: Station, Milepost 0.833 to 2.786

PREPARED BY: Anthony Duca, Envision Consultants, Ltd.

DATE: May 29, 2012

DESCRIPTION:
It was requested that a time impact analysis be completed to show the effect that the Permit Modifications for MTD 1 and 4 had on the schedule. This analysis is based on the completion of Update #2 of the schedule, which had a data date of August 2, 2011. For the purpose of this analysis an exact copy of Update 2 was created with the Project ID *001998500-U2-TIA1*. There are no other differences between *001998500-U2-TIA1* and *001998500-U2* which was submitted by Tarheel Enterprises and approved by NJDOT in November of 2011.

ACTIVITIES AFFECTED:

Activity ID	Activity Name
D1010	Permit Modifications for MTD 1 and 4
A1060	Submit Manufactured Treatment Devices 1 & 4
A1560	Approve Manufactured Treatment Devices 1 & 4
A2060	Fab & Deliver Manufactured Treatment Devices 1 & 4
C1090	Install MTD 1, Bypass, and 15" RCP
C1095	Install MH A30+83, Bypass, and 15" RCP
C1110	Sub-Base Sta A27+00 to B12+25
C1115	DGABC Sta A27+00 to B12+25
C1135	9x16 Concrete Curb Sta A27+00 to B12+25
C1120	HMA 37.5M64 Base Course Sta A27+00 to B12+25
C1125	HMA 19h64 Intermediate Course Sta A27+00 to B12+25
C1130	SMA 9.5mm Top Course Sta A27+00 to B12+25
C2000	Reset MPT Devices From Stage 1 to Stage 2
C2145	Excavation for Wall 1 @ Sta A18+25 to A19+10
C2150	Form & Pour Leveling Pads for Wall 1 @ Sta A18+25 to A19+10
C2155	Cure Leveling Pads for Wall 1 @ Sta A18+25 to A19+10
C2160	Install Panels & Backfill for Wall 1 @ Sta A18+25 to A19+10
C2165	Install Pre-cast Parapet for Wall 1 @ Sta A18+25 to A19+10
C2170	Form & Pour Moment Slab for Wall 1 @ Sta A18+25 to A19+10
C2175	Cure Moment Slab for Wall 1 @ Sta A18+25 to A19+10
C1035	Excavate for Basin
C1036	Install Pre-cast Footings for Basin Culvert
C1038	Install Basin Culvert
C1050	Install 15" RCP to Basin
C1055	Install MTD 8 & Bypass
C1065	Install 15" RCP to MTD 8 & Bypass

C1075	Install Inlet, Type E Sta A21+64
C1080	Install Inlet, Type B Sta A21+64
C1020	Sub-base Outlet Drain
C2015	Underlayer Prep for Concrete Paving Sta A10+00 to A27+00
C2025	Sub-Base for Concrete Paving Sta A19+90 to A24+00
C2030	Pour Concrete Paving 14.5" Sta A19+90 to A24+00
C2035	Cure Concrete Paving Sta A19+90 to A24+00
C2040	DGABC Sta A10+00 to A27+00
C2045	HMA 37.5M64 Base Course Sta A10+00 to A27+00
C2050	HMA 19h64 Intermediate Course Sta A10+00 to A27+00
C2055	SMA 9.5mm Top Course Sta A10+00 to A27+00
C2065	Roadway Excavation Sta 129+50 to 135+15
C2070	Sub-Base Sta 129+50 to 135+15
C2075	DGABC Sta 129+50 to 135+15
C2080	HMA 37.5M64 Base Course 129+50 to 135+15
C2085	HMA 19h64 Intermediate Course 129+50 to 135+15
C2090	SMA 9.5mm Top Course Sta 129+50 to 135+15
C2135	Install Guide Rail Sta 118+00 to 125+70
C2140	Install Guide Rail Sta 135+20 to 139+60
C3000	Reset MPT Devices From Stage 2 to Stage 3
C1285	Install Inlet, Type B Sta D29+50
C1340	Demo Existing Headwall
C1370	Form & Pour New Headwall
C1375	Cure New Headwall
C1425	Install 15" RCP from Inlet, Type B Sta D29+50 to Headwall
C3050	Temporary Sheeting for Wall 2 @ Sta D30+00 to D45+33
C3055	Excavate for Wall 2 @ Sta D30+00 to D45+33
C1310	Replacing Existing pipe with new 18" RCP
C3060	Pre-treat Excavation for Wall 2 @ Sta D30+00 to D45+33
C3065	Form & Pour Leveling Pads for Wall 2 @ Sta D30+00 to D45+33
C3070	Cure Leveling Pads for Wall 2 @ Sta D30+00 to D45+33
C3075	Install Panels & Backfill for Wall 2 @ Sta D30+00 to D45+33
C3080	Install Pre-cast Parapet for Wall 2 @ Sta D30+00 to D45+33
C3085	Form & Pour Moment Slab for Wall 2 @ Sta D30+00 to D45+33
C3090	Cure Moment Slab for Wall 2 @ Sta D30+00 to D45+33
C3095	Backfill Front Face for Wall 2 @ Sta D30+00 to D45+33
C3010	Roadway Excavation Sta 143+00 to 176+00
C3015	Sub-Base Sta 143+00 to 176+00
C3040	Install Barrier Curb Sta B19+14 to B26+00
C3020	DGABC Sta 143+00 to 176+00
C3025	HMA 37.5M64 Base Course 143+00 to 176+00
C3030	HMA 19h64 Intermediate Course 143+00 to 176+00
C3035	SMA 9.5mm Top Course Sta 143+00 to 176+00
C3045	Install Guide Rail Sta C25+17 to D30+00
M0900	Substantial Completion Date
M0820	Stage 3 Completed
C4145	Planting @ Riparian Zone Mitigation Area
C0510	Punchlist
M1000	Completion

TYPE OF IMPACT: Schedule Delay

INCREASED DURATION: 68 days **AMOUNT:** N/A

DELAYED DATE/SUSPENSION OF WORK: April 11, 2011

FRAGNET:
A copy of the approved baseline was created with the Project ID *001998500-BL-TIA1*. There are no other differences between *001998500-BL-TIA1* and *001998500-BL* submitted by Tarheel Enterprises and approved by NJDOT. For the purpose of this time impact analysis Update 2 was compared to the Baseline.

Figure 1 below is from page 1 of the attached file 001998500 *Update 2 vs Baseline - Longest Path.pdf* highlighting activity *D1010 - Permit Modifications for MTD 1 and 4*. This activity was added in Update 1 to represent the delay caused by the permit modification for Manufactured Treatment Devices 1 and 4. Since this activity did not exist in the Baseline, the Baseline Start and Finish fields are blank.

Figure 1

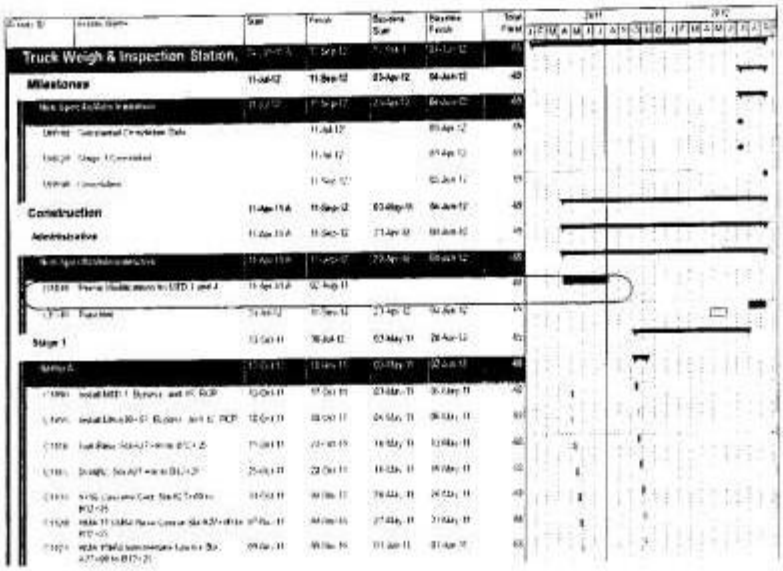
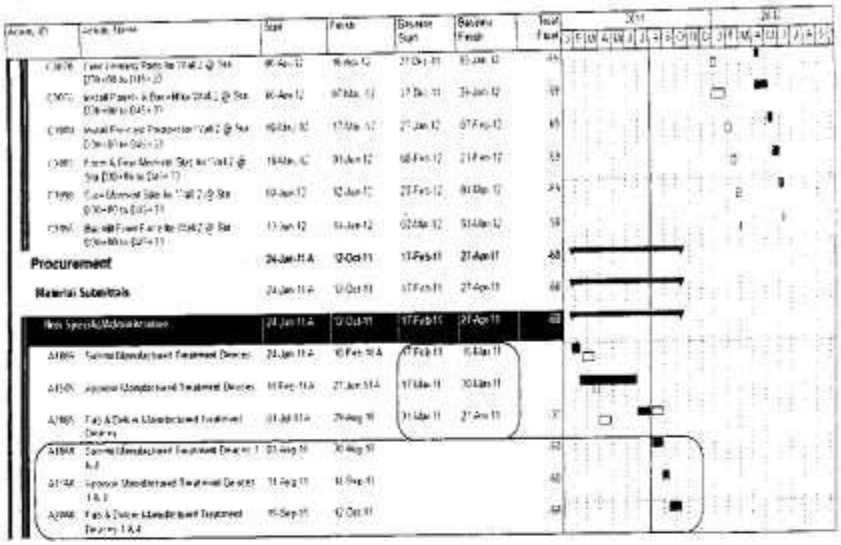


Figure 2 below is from page 5 of the attached file 001998500 *Update 2 vs Baseline - Longest Path.pdf*. Due to the delay caused by the permit modifications for Manufactured Treatment Devices 1 & 4, three new procurement activities; *A1060 - Submit Manufactured Treatment Devices 1 & 4, A1560 - Approve Manufactured Treatment Devices 1 & 4, and A2060 - Fab & Deliver Manufactured Treatment Devices 1 & 4*, were created to represent the time for the submission, review and approval, and fabrication and delivery for Manufactured Treatment Devices 1 & 4. The duration of these activities was typical of other procurement activities in the schedule; 20 days for submission, 10 days for review, and 20 days for delivery.

Figure 2



These three activities, along with the delay activity D1010, were incorporated into the logic of the schedule by creating relationships listed in Table 1

Table 1

Pred ID	Pred Name	Succ ID	Succ Name	Rel Type
M0500	Notice to Proceed	D1010	Permit Modifications for MTD 1 and 4	FS
D1010	Permit Modifications for MTD 1 and 4	A1060	Submit Manufactured Treatment Devices 1 & 4	FS
A1060	Submit Manufactured Treatment Devices 1 & 4	A1560	Approve Manufactured Treatment Devices 1 & 4	FS
A1560	Approve Manufactured Treatment Devices 1 & 4	A2060	Fab & Deliver Manufactured Treatment Devices 1 & 4	FS
A2060	Fab & Deliver Manufactured Treatment Devices 1 & 4	C1090	Install MTD 1, Bypass, and 15" RCP	FS
A2060	Fab & Deliver Manufactured Treatment Devices 1 & 4	C1295	Install MTD 4, Bypass, and 18" RCP	FS

In Figure 2 above, the activities *A1005 - Submit Manufactured Treatment Devices, A1505 - Approve Manufactured Treatment Devices, and A2005 - Fab & Deliver Manufactured Treatment Devices* are displayed. In Update 2 these three activities are not part of the longest path, but are displayed in order to display the Start and Finish dates of these activities from the Baseline, as these were the predecessor activities to all the Manufactured Treatment Devices prior to the permit modifications for 1 and 4. Since they are not driving predecessors to the construction activities for the Manufactured Treatment Devices 1 and 4 in Update 2, their current dates in Update 2 are not pertinent to this analysis.

EVALUATION/RESPONSIBILITY

Per the Baseline the procurement activities for all of the Manufactured Treatment Devices was scheduled to be completed on April 27, 2011. It was discovered that a permit modification for Manufactured Treatment Devices 1 and 4 was required on April 11, 2011, with the modification completed on August 2, 2011. With the newly created procurement activities for Manufactured Treatment Devices 1 and 4 a scheduled completion date of October 12, 2011, a difference of 168 calendar days, or 117 work days with the original scheduled completion date for the procurement of the Manufactured Treatment Devices.

The procurement of the Manufactured Treatment Devices 1 and 4 became the start of the critical path in Update 1 when they were created, and remained the start of the longest path in Update 2, calculating a negative total float of 68 work days on final completion.