WASTEWATER PROGRAM

MASTER SCHEDULING SPECIFICATIONS

CONTRACTORS CONSTRUCTION SCHEDULE AND REPORTS

(MODERATE FORM)

For use on medium sized projects in the range of $3 million to $10 million in cost or on smaller sized projects with a high degree of complexity or multiple interfaces with other projects.

21. CONTRACTOR'S CONSTRUCTION SCHEDULE AND REPORTS (12/10/92)

[MODERATE FORM]

$# _____

NTS: For use on medium sized projects ($3 million to $10 million in cost) or smaller sized projects with a high degree of complexity or interfaces with other projects.

_____ #$

A. PROGRESS OF THE WORK

It is expressly understood and agreed that the time of beginning, the rate of progress, and the time of completion of the work are of the essence of this Contract. The work shall be executed with such progress as required to prevent any delay to other contractors working on other contracts at the site, the Contract milestones, and the general completion of the Contract.

B. CONTRACTOR'S CONSTRUCTION SCHEDULER

1. The CONTRACTOR shall continuously employ or retain the services of a Construction Scheduler. The Construction Scheduler shall have at least three (3) years of verifiable experience as the person primarily responsible for preparing and maintaining detailed project schedules on projects of the same or similar size and nature as this project. The Construction Scheduler is required to attend all meetings pertaining to scheduling and progress of the work.

2. Within five (5) days after the Notice of Award the CONTRACTOR shall provide a statement to the ENGINEER with the following:

   a. Identification, qualifications, and experience of the CONTRACTOR'S Construction Scheduler and all other members of the CONTRACTOR'S scheduling staff.

   b. References of not less than two (2) previous projects on which the CONTRACTOR'S Construction Scheduler has utilized CPM scheduling.

   (As used in this Article, "days" mean consecutive calendar days unless otherwise noted.)

3. The ENGINEER and the INSPECTOR reserve the right to disapprove any candidate or Scheduling System proposed for the project.

C. GENERAL

1. Schedule Methodology

   The scheduling method to be used shall be a Critical Path Method schedule in the form of an activity on arrow (I-J format) oriented network diagram or an

activity on node Precedence Diagram Network (PDN) with capabilities of identifying the critical path. The principles and definitions of the terms used herein shall be as set forth in the Associated General Contractor's publication "CPM in Construction", latest edition. To the extent there are any conflicts between the Associated General Contractor's publication and the Specifications, the Specifications shall govern.

2. Work Breakdown Structure

The CONTRACTOR shall submit to the ENGINEER for approval, at the Preconstruction Scheduling Conference, the following:

a. A work breakdown structure;

b. The associated alpha-numeric coding structure to implement the work breakdown structure;

c. The activity identification system for labelling all work activities.

3. The first code field shall designate the bid item. The second code field shall identify the type of activity. (Types of activities shall be defined as "submittal", "review/approval", "procurement/fabrication", "delivery", "construction/installation" or "change order".) The third code field shall identify which Specification section the activity shall be paid under. The fourth code field shall identify who is responsible to perform the activity (i.e., CONTRACTOR, SUBCONTRACTOR(S), SUPPLIER, etc.). The fifth code field shall identify the area being worked in or the facility, if appropriate. The sixth code field shall identify the construction phase or project element (if phasing of work or project elements are identified in the Contract.) All Change Orders and Notices of Non-Compliance shall be included as separate code fields.

4. Scheduling System

The CONTRACTOR shall use Primavera Project Planner, Version 5.0 or a later version, or Time Machine, Version 3.16D or later version, and a hardware system commensurate with the size of the project. This shall be referred to as the Scheduling System. The system shall be capable of handling, processing, printing, and plotting data to satisfy all requirements of Article 21.

D. PRECONSTRUCTION SCHEDULING CONFERENCE

The ENGINEER will schedule and conduct a Preconstruction Scheduling Conference with the CONTRACTOR'S Project Manager and Construction Scheduler within seven (7) days after Notice of Award, to commence development of the required project schedule. At this meeting, the requirements of this Article, as they apply to the Contract, will be reviewed with the CONTRACTOR. The CONTRACTOR shall be prepared to review and discuss methodology for the schedule and sequence of operations plus cost, manpower, and equipment loading methodology.

E. CONTRACTOR'S PROJECT SCHEDULE

1. Fifteen (15) days after the Preconstruction Scheduling Conference, the

ENGINEER shall meet with the CONTRACTOR to receive an update on the progress in the development of the Project Schedule. The CONTRACTOR shall submit to the ENGINEER the Project Schedule within thirty (30) days after the Preconstruction Scheduling Conference.

2. The Project Schedule shall show the sequence and interdependence of activities required for complete performance of the work, beginning with the date of the Notice to Proceed and concluding with the date of Final Completion of the Contract.

3. Pursuant to the float sharing requirements of the Contract, use of float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity times or imposed dates shall be cause for rejection of the Project Schedule and any revisions or updates. The use of float time disclosed or implied by the use of alternative float suppression techniques shall be shared as directed by the ENGINEER.

4. If the CONTRACTOR submits a Project Schedule showing completion of the work more than thirty (30) work days in advance of the Contract completion date, the CONTRACTOR agrees that the ENGINEER may, at no cost to the CITY, decrease the Contract duration by issuance of a Change Order which will change the appropriate Milestone Date(s) and the Contract completion date to the completion date reflected on the Project Schedule. Any approved schedule, revision, or update having an early completion date shall show the time between the early completion date and the current Contract completion date as "project float".

5. The ENGINEER will review and make comments on the Project Schedule. Meetings will be held between the ENGINEER, the CONTRACTOR, and all SUBCONTRACTORS and SUPPLIERS whom the CONTRACTOR may desire to invite or whom the ENGINEER may request be present.

6. Comments made by the ENGINEER on the Project Schedule, during review, will not relieve the CONTRACTOR from compliance with requirements of the Contract Documents. To the extent that there are any conflicts between the approved schedule and the requirements of the Contract Documents, the Contract Documents shall govern.

7. If requested by the ENGINEER at any time during the project, the CONTRACTOR shall provide highly detailed, short-term schedules for specific crucial items (work-arounds, start-up, etc.).

8. The CONTRACTOR will be compensated for the cost of including Change Orders on the Project Schedule, if such changes are required or requested by the ENGINEER. All such inclusions shall be incorporated into the schedule at a fixed fee of $200 per Change Order.

F. NETWORK DETAILS

1. The Project Schedule for the Contract shall include time-scaled network diagrams, based on working days, as well as computer tabulations. It shall be constructed to show the order in which the CONTRACTOR proposes to carry out the work, to indicate restrictions of access and to show availability of work areas, and

availability and use of manpower, materials and equipment. The CONTRACTOR shall utilize the Project Schedule in planning, scheduling, coordinating, and performing the work under the Contract (including all activities of SUBCONTRACTORS, equipment vendors, and SUPPLIERS). The CONTRACTOR will provide the ENGINEER with written confirmation of the concurrence of all major trade SUBCONTRACTORS and SUPPLIERS with the Project Schedule. (The term "major SUBCONTRACTORS and SUPPLIERS" as used in this Article, shall include any SUBCONTRACTOR or SUPPLIER with five (5) percent or more of the value of the Contract.)

2. The Project Schedule shall provide the ENGINEER with a tool to monitor and follow the progress of all phases of the work. The Project Schedule submitted to the ENGINEER shall comply with all limits imposed by the scope of work, with all contractually specified intermediate milestone and completion dates, and with all constraints, restraints or sequences included in the Contract. The degree of detail shall include factors to the satisfaction of the ENGINEER, including, but not limited to:

   a. Physical breakdown of the project;

   b. Contract milestones and completion dates, substantial completion dates, constraints, restraints, sequences of work shown in the Contract, the planned substantial completion date, and the final completion date;

   c. Type of work to be performed, the sequences, and the labor trades involved.

   d. All purchase, submittals, submittal reviews, manufacture, tests, delivery, and installation activities for all major materials and equipment, and a separate list of all major material items or items of equipment for which the CONTRACTOR intends to seek payment prior to installation;

   e. Deliveries of CITY furnished equipment and/or materials in accordance with the dates or schedule windows of such items set forth in the Contract or furnished by the ENGINEER, or items to be salvaged and delivered to the CITY;

   f. Preparation, submittal and approval of shop and/or working drawings and material samples showing a thirty (30) day minimum time specified for the ENGINEER'S review of normal or routine submittals and a forty five (45) day review time for all major submittals, so identified in the Specifications, and the same timeframe shall be allowed for at least one (1) resubmittal on all major submittals so identified in the Contract Documents;

   g. Approvals required by regulatory agencies or other third parties;

   h. Plans for all subcontract work;

   i. Assignment of responsibility for performing specific activities;

   j. Access to and availability of work areas including all anticipated plant shutdowns;

k. Identification of interfaces and dependencies with preceding, concurrent and follow-on CONTRACTORS and utilities as shown on the Plans or called out in the Specifications;

l. Resource loading for cost, manpower, material, and equipment;

m. Actual tests, submission of test reports, and approval of test results;

n. All start up, testing, training, and assistance required under the Contract;

o. Planning for phased or total takeover by the CITY;

p. Punchlist and final cleanup; and

q. Identification of any manpower, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as two shifts, six (6) day weeks, specified overtime, or work at times other than regular days or hours, shall be clearly identified in the Project Schedule.

3. The activities included in the Project Schedule shall be analyzed in detail to determine activity time durations in units of project working days. Durations shall be based on the labor, equipment, and materials required to perform each activity on a normal work day basis. No on-site activity shall have a duration over fifteen (15) working days except non-construction activities such as submittals, submittal reviews, procurement and delivery of materials or equipment, and concrete curing. Only on-site construction activities will be shown in their resource loaded state to reflect cost, manpower, materials and equipment except for those activities specifically identified under Paragraph 21.F.3.d. The manpower to be assigned and equipment, by item designation, shall be shown for each construction activity for the network on a tabular listing, and in information furnished in accordance with Paragraphs 21.O and 21.P.

4. Critical or near critical paths resulting from the use of manpower or equipment restraints shall be kept to a minimum. Near critical paths shall be defined as those paths having fifteen (15) working days or less of total float at the time of initial submission.

5. The estimated cost to perform each work activity shall be noted for each activity in the network on a tabular listing. The sum of the costs assigned to all activities shall equal the Contract value. No activity costs shall be assigned to submittals or submittal reviews. The accepted cost loaded Project Schedule shall constitute the Schedule of Values from which monthly progress payments will be made in accordance with the provisions of **PARTIAL PAYMENTS** in these General Requirements.

6. The network diagram shall be prepared on (E) size sheets (28 inches by 40 inches), shall have a title block in the lower right-hand corner, and a timeline on each page. Exceptions to the size of the network sheets and the use of computer graphics to generate the networks shall be subject to the approval of the ENGINEER.

7. All networks shall be drafted time scaled to show a continuous flow of information from left to right. The primary path(s) of criticality shall be clearly and graphically identified on the network(s).

G. PROJECT SCHEDULE REPORTS

1. The Project Schedule submitted to the ENGINEER shall include the time scaled network diagram. Network diagrams shall be based on early start and early finish dates of activities shown. The network diagrams submitted to the ENGINEER shall also be accompanied by a computer-generated mathematical analysis for each activity included in the Project Schedule. Such mathematical analysis shall be submitted to the ENGINEER and shall include at a minimum, the following:

   a. Predecessor and successor activity numbers and descriptions;

   b. Activity number and description;

   c. Activity code(s);

   d. Schedule and actual/remaining duration for each activity;

   e. Earliest start date (by calendar date);

   f. Earliest finish date (by calendar date);

   g. Actual start date (by calendar date);

   h. Actual finish date (by calendar date);

   i. Latest start date (by calendar date);

   j. Latest finish date (by calendar date);

   k. Float in work days;

   l. Monetary value of each activity;

   m. Percentage of activity complete and remaining duration for incomplete activities;

   n. Cumulative value of work complete, based on the Contractor's reported portion of activities complete and accepted;

   o. Imposed constraints.

2. The following computer outputs shall be required as part of the Project Schedule submittal and each revision or update thereafter as a condition precedent to receipt of progress payments:

   a. Activity listing showing predecessor and successor activities in numerical

order, with early start, early completion, late start, late completion and total float;

b. A sublisting of materials and equipment sorted by specification section number. The sublisting of materials and equipment shall include the following activities: preparation of shop drawings, submittal to the ENGINEER, review by the ENGINEER, and fabrication, testing, and/or delivery of material and equipment which shall be interfaced with the earliest start date that the material or equipment is to be installed on the project.

3. Outputs 1 and 2 above shall show all activities, including restraints, for the duration of the project.

4. The CONTRACTOR shall submit to the ENGINEER, a printed copy of the Predecessor/Successor Report. The data to provide other schedule reports shall be submitted on computer diskette(s).

H. APPROVAL OF BASELINE PROJECT SCHEDULE

1. The Project Schedule network diagram and computer tabulations, the Cash Flow Projection, and the Manpower Requirements Forecast shall be submitted to the ENGINEER for approval within thirty (30) days after the Preconstruction Scheduling Conference in the following quantities:

a. Three (3) sets of the Network Diagram;

b. Computer tabulations (three (3) copies 8 1/2" x 11" in size);

c. Manpower Requirements Forecast (three (3) copies 8 1/2" x 11" in size);

d. Cash Flow Projection (three (3) copies 8 1/2" x 11" in size).

e. All required reports specified in Paragraphs 21.F and 21.G (three (3) copies).

f. Computer diskette.

g. Written confirmation of concurrence of all major trade SUBCONTRACTORS and SUPPLIERS.

2. Approval Process:

a. The ENGINEER shall approve or disapprove, in writing, the CONTRACTOR'S submission within fourteen (14) days after receipt of all required information. The Project Schedule, once approved, becomes the Baseline Record Schedule which shall be used for monitoring and evaluating all facets of Contract performance, including, but not limited to; progress, changes, and delays, and shall be referred to as the Record Schedule.

b. The CONTRACTOR, the CONTRACTOR'S Construction Scheduler, and those major trade SUBCONTRACTORS and SUPPLIERS required by the ENGINEER shall be required to participate in all meetings necessary to reach mutual agreement and approval of the initial Project Schedule, the Manpower Requirements Forecast, and the Cash Flow Projection.

c. The CONTRACTOR shall revise the schedule, as required by the ENGINEER, to reflect project construction. If any of the required submissions are returned to the CONTRACTOR for corrections or revisions, they shall be resubmitted along with a new computer diskette(s) and a hard copy listing of each change for approval within seven (7) days after receipt. Resubmittals shall be as required in Paragraph 21.H.1 and 2. Review and response by the ENGINEER shall be given within seven (7) days after receipt of each new submission.

d. Should the Baseline Project Schedule, submitted for approval, show variances from the requirements of the Contract, the CONTRACTOR shall make specific mention of such variations in the letter of transmittal, in order that, if accepted, proper adjustments to the Project Schedule can be made. Otherwise, the CONTRACTOR will not be relieved of the responsibility for executing the work in strict accordance with the requirements of the Contract Documents.

e. If the CONTRACTOR fails to submit the initial Project Schedule, the Manpower Requirements Forecast, the Cash Flow Projection, major trade SUBCONTRACTOR and SUPPLIER confirmation in writing, or the computer diskette(s), within the time prescribed, or revisions thereof within the required time, it is within the ENGINEER'S discretion to stop the CONTRACTOR'S work at no additional cost to the CITY. Further, no Mobilization Progress payments shall be made until such time as the CONTRACTOR submits the required information and obtains approval of the Baseline Project Schedule. Approval of the Baseline Project Schedule is a condition precedent to payment of any portion of the Mobilization Payment.

f. Failure of the CONTRACTOR to submit the Baseline Project Schedule or any required resubmittals, in a timely, accurate manner and in accordance with the requirements of this Article will result in costs to the CITY which are difficult if not impossible to determine; therefore, the CONTRACTOR shall pay the CITY liquidated damages in the amount of $500 per work day, for every work day the schedule submittal, revision, or resubmittal is late. This amount shall be subtracted from any monies due and shall be forfeited by the CONTRACTOR.

I. REVISIONS TO APPROVED BASELINE PROJECT SCHEDULE

1. The CONTRACTOR shall prosecute the work in accordance with the approved Baseline Project Schedule. Out of sequence construction, defined as a change in the Project Schedule, requires prior approval of the ENGINEER as defined below.

2. Upon approval of a Change Order, or issuance of an Emergency Change

Authorization (ECA), a Time and Materials (T&M) Change Order or a Unilateral Change Order, the change shall be reflected in the next schedule submittal by the CONTRACTOR.

3. No change to the approved Baseline Project Schedule or the Record Schedule shall be made without the prior written approval of the ENGINEER. If the CONTRACTOR desires to make a change to the approved Baseline Project Schedule, the CONTRACTOR shall request permission from the ENGINEER in writing, stating the reasons for the change as well as the specifics, such as revisions to activities, logic, durations, etc. The ENGINEER will provide a response within five (5) days.

4. If the ENGINEER considers a schedule change to be of a major nature, the ENGINEER may require the CONTRACTOR to revise and submit for acceptance all of the affected portion(s) of the Project Schedule and an analysis to show the effect on the entire project. The proposed revision and analysis shall be submitted to the ENGINEER within fifteen (15) days after the ENGINEER notifies the CONTRACTOR the revision is of a major nature. A change will be considered to be of a major nature if the time estimated for an activity or sequence of activities is varied from the original plan to the degree that there is reasonable doubt that the Contract completion date will be met, or if the change impacts the work of other CONTRACTORS at the jobsite. Changes to activities having adequate float shall be considered as minor changes, except that an accumulation of minor changes may be considered a major change when such changes affect the Contract completion date. (Activities having adequate float are activities which are not critical after the change is made.)

5. Only upon approval of a change by the ENGINEER shall it be reflected in the next schedule update submitted by the CONTRACTOR.

J. UPDATES TO APPROVED BASELINE PROJECT SCHEDULE AND PROGRESS PAYMENTS

1. Monthly Update Meetings:

   a. All updated or revised schedules shall be submitted in the same detail as the original submittal, unless modified in writing by the ENGINEER. Written confirmation of the major trade SUBCONTRACTORS and SUPPLIERS shall be required quarterly.

   b. The initial updating shall be submitted within the fourteen (14) days after approval of the Baseline Project Schedule. The updating shall be cost loaded. Subsequent updates shall be submitted at the beginning of each month thereafter for the duration of the Contract. The data date shall be the first working day of the month. The Project Schedule and computer tabulations shall be reviewed by the CONTRACTOR'S Construction Scheduler at a joint update meeting with the ENGINEER and the INSPECTOR.

2. Monthly Updated Schedules:

   a. The CONTRACTOR shall submit the Monthly Update Schedule to the

ENGINEER each month, on a date assigned by the ENGINEER. The proposed update schedule prepared by the CONTRACTOR shall include all information available as of the cutoff date established by the ENGINEER. A detailed list of all proposed schedule changes (logic, duration, status, additions, and deletions) shall be submitted with the update. Prior to the monthly update review meeting, the CONTRACTOR shall obtain from his SUBCONTRACTORS, SUPPLIERS, and staff the necessary information as required to reflect progress to date. A proposed Monthly Update Schedule containing the information set forth below shall be available for review at the meeting.

(1) For activities started and/or completed during the previous period: Actual start and actual completion dates, and number of shifts used to accomplish the activity.

(2) For activities begun but not yet complete to date: Remaining duration of the work, estimated percent complete, and estimated completion date.

(3) For activities not yet started: Estimated start dates, revised durations, and estimated completion dates, as necessary.

(4) For authorized Change Orders, including Emergency Change Authorizations, Time and Material Change Orders, and Unilateral Change Orders: Revised activities, number of shifts, crew sizes by craft, construction equipment required, and durations, and status of all outstanding Notices of Non-Compliance, where required.

(5) The monthly update of the Network Diagram shall be for the month preceding the meeting and for the remainder of the project. The previous month's activities shall be reported as they actually took place and designated as actually complete, if actually completed, on the network diagram update.

(6) Portions of the Network Diagram on which all activities are complete need not be reprinted and submitted in subsequent updates. However, the electronic disk file of the submitted Network Diagrams and the related reports shall constitute a clear record of progress of the work from Notice to Proceed to final completion.

(7) The monthly submittal to the ENGINEER shall be accompanied by a Schedule Narrative Report. The Schedule Narrative Report shall describe the physical progress during the report period, plans for continuing the work during the forthcoming report period, actions planned to correct any negative float predictions, and an explanation of potential delays and/or problems and their estimated impact on performance and the overall project completion date. In addition, alternatives for possible schedule recovery to mitigate any potential delay and/or cost increases shall be included for consideration by the ENGINEER. The

report shall follow the outline set forth below:

CONTRACTOR'S Schedule Narrative Report Outline:

* CONTRACTOR'S Transmittal Letter
* Description of problem areas
* Current and anticipated delays
  - Cause of the delay
  - Corrective action and schedule adjustments to correct the delay
  - Impact of the delay on other activities, milestones, and completion dates
* Changes in construction sequences
* Pending items and status thereof
  - Permits
  - Change Orders
  - Time extensions
  - Non-Compliance Notices
* Contract completion date(s) status
  - Ahead of schedule and number of working days
  - Behind schedule and number of working days
* Other project or scheduling concerns including any plant shutdowns, duration of each shutdown, and analysis of any work to be performed during the shutdown period
* Include reviewed and updated Network Diagram and Reports
* Include revised Cost Loading and Cash Flow Information (Paragraph 21.L)

(8) The CONTRACTOR shall provide to the ENGINEER, printed copies of the Predecessor/Successor Report, a printed list of all changes made to the previously approved Record Schedule, and the Schedule Narrative Report. The data required to provide all other scheduling reports called for in Paragraph 21.J shall be provided on computer diskette(s).

3. The CONTRACTOR'S Construction Scheduler shall attend the monthly update meetings with the above data prepared in advance for each meeting to provide, as of the end of the updating period, a complete and accurate report of the current procurement schedule (in accordance with the requirements of **QUALITY CONTROL** of these General Conditions), construction progress, and a depiction of how the CONTRACTOR plans to continue the work of the project to meet all Contract completion dates. All network changes and status dates agreed to during each update meeting shall be considered as acceptable by all parties unless written notice of exception is given by an objecting party within five (5) days after the update meeting. For major network changes that cannot be agreed to during an update meeting, the CONTRACTOR shall submit, in writing, such revisions for the ENGINEER'S approval prior to inserting such changes into the network. Submissions may be in the form of marked-up networks, fragnets, or schedule abstracts provided they are submitted with a letter of transmittal. The

submission and approval procedures for this information shall follow the same timetable described in Paragraph 21.N.

4. Predicated on the results of the ENGINEER'S review of monthly submissions of the updated Project Schedule or Record Schedule and accompanying reports, the CONTRACTOR may be required to revise the Project Schedule. Conditions under which a revision will be made are as follows:

   a. When a delay in the completion of any work item or sequence of work items results in an indicated extension of the project completion or interim milestone dates detailed herein by ten (10) working days or more.

   b. When delays in submittals or deliveries or work stoppages are encountered which make replanning, rescheduling, or resequencing of the work necessary.

   c. When the schedule does not represent the actual prosecution and progress of the project.

5. Required revisions of the Monthly Update Schedules are due within five (5) days of notice by the ENGINEER that a revision is required. All revisions and additions to the Project Schedule are subject to the review of the ENGINEER. No changes are to be implemented in the schedule by the CONTRACTOR without the prior approval of the ENGINEER. When the Monthly Schedule Update or its required revision is approved by the ENGINEER, it then becomes the Current Record Schedule. The Current Record Schedule will be used for the period from which it is approved until its successor is submitted and approved.

6. Three (3) copies each of the Schedule Narrative Report, the updated Project Schedule (networks, and computer computations), the Cash Flow Projection, the updated network diagram, and one (1) copy of the updated computer disk reflecting the status of the project agreed to at the updating meeting, shall be submitted to the ENGINEER within five (5) days after each updating meeting in accordance with Paragraph 21.J.2.a.(8).

7. The update report shall show the activities or portions of activities completed during the reporting period and their total value as the basis for the CONTRACTOR'S periodic request for payment. Payments made pursuant to **PARTIAL PAYMENTS** of these General Conditions, will be based on the total value of such activities completed or partially completed after verification by the INSPECTOR. The report shall state the percentage of the work actually complete as of the report date. If the project is behind schedule, progress along other paths with negative float shall also be reported.

8. Failure of the CONTRACTOR to submit schedule updates in a timely, accurate manner and in accordance with the requirements of this Article will result in costs to the CITY which are difficult, if not impossible to determine; therefore, the CONTRACTOR shall pay the CITY liquidated damages in the amount of $500 per work day for every work day the submittal is late or not in full compliance with the requirements of this Article. This amount shall be deducted from any monies due, and forfeited by the CONTRACTOR. In addition to the liquidated damages, if the CONTRACTOR continues to fail to submit any of the update deliverables,

or to meet any of the other updating requirements, for a period of thirty (30) days or more beyond the required submittal date, progress payments will be withheld until such time as the CONTRACTOR submits the required update requirements.

K. WEEKLY PROGRESS REPORTS

1. Once each week, on a day established by the ENGINEER, the CONTRACTOR shall submit two progress schedules:

   a. The first shall be a progress schedule listing the activities completed and in progress for the previous week and the activities scheduled for the succeeding two (2) weeks. The activity designations shall be consistent with the activity designations in the Current Record Schedule. A bar chart shall be used to display the information in pictorial form. The appropriate schedule activity number shall be listed for each bar.

   b. The second shall be a utility work/access alteration report. This report and schedule shall include any and all work on the plant's operational utilities, equipment, process piping, sewers, and like detail as well as access alterations and plant shutdowns.

L. COST LOADING AND CASH FLOW

1. With the initial Project Schedule submittal, each monthly update, and each revision, the CONTRACTOR shall also submit a schedule of cost loading and cash flow to the ENGINEER. There shall be a strict correlation between the sum of individual activity costs and the total values indicated for bid items. That is, each individual activity within the Project Schedule shall employ a code which, in summary, attaches its cost, if any, to the appropriate bid items. The sum of activity costs within a specific code, then, shall equal the cost of its corresponding bid items and approved Change Orders.

2. Expected payment requests for each month shall be included with proposed updates. The cash flow shall show the net payment requests for each month and the cumulative payment requests to date shall also be shown after deducting retainage and any other monies withheld. The cash flow shall be shown in tabular format and in graphic format.

3. The CONTRACTOR, at the Preconstruction Scheduling Conference, shall explain in detail the procedure to be used to develop the schedule activity cost loading and cash flow. This procedure is subject to the review and approval of the ENGINEER and the INSPECTOR. Receipt and approval of the Schedule Cost Loading and Cash Flow Summary is a condition precedent to the making of any payments under the Contract. Therefore, failure to submit an acceptable schedule cost loading and cash flow summary shall be cause for withholding any progress payments due or that may become due under this Contract, until such time as an acceptable cost loading and cash flow summary is received.

4. In accordance with the updating procedures, when an activity is deemed substantially complete by the ENGINEER, then such activity will no longer be treated as an activity affecting the critical path or successor activities on the project. The cost of correction of any punchlist items associated with

substantially completed activities will be covered by withheld retention or other amounts deemed by the ENGINEER to be adequate to cover such costs.

M. RESPONSIBILITY FOR COMPLETION

1. Whenever it becomes apparent from the current monthly updated Project Schedule that phasing, milestone, constraint, restraint, or Contract completion dates will not be met, the CONTRACTOR shall execute some or all of the following remedial actions:

   a. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.

   b. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.

   c. Reschedule the work in conformance with the Specification requirements.

2. Prior to implementing any of the above actions, the CONTRACTOR shall notify and obtain approval from the ENGINEER. If such actions are approved, the Project Schedule revisions shall be incorporated by the CONTRACTOR into the Network Diagram before the next update.

3. Under no circumstances will the addition of equipment or construction forces, increasing the working hours or any other method, manner, or procedure to return to the contractually required completion date be considered justification for a Change Order or be treated as acceleration where the need for a recovery schedule has been caused by the CONTRACTOR and/or its SUBCONTRACTORS or SUPPLIERS, at any tier.

4. The ENGINEER may elect to withhold progress payments until the CONTRACTOR'S progress indicates that the milestone date(s) and/or the Contract completion date will be met.

N. SCHEDULE TIME EXTENSIONS

1. When Change Orders or delays are experienced by the CONTRACTOR and a time extension is requested, the CONTRACTOR shall submit to the ENGINEER, a written Time Impact Analysis illustrating the influence of each change or delay on the current Contract schedule completion date utilizing the approved Current Record Schedule. Each Time Impact Analysis shall include a fragnet demonstrating how the CONTRACTOR proposes to incorporate the Change Order or delay into the Current Record Schedule. A fragnet is defined as a sequence of new and/or activity revisions that are proposed to be added to the approved Baseline Project Schedule or Current Record Schedule in effect at the time the change or delay is encountered to demonstrate the influence of the delay and the method for incorporating the delay and its impact into the schedule as they are encountered.

2. Each Time Impact Analysis shall demonstrate the estimated time impact based on the events of delay, the date the Preliminary Change Order, Emergency

Change Authorization, the Time and Materials Change Order, or the Unilateral Change Order was given to the CONTRACTOR, the status of construction at that point in time, and the event time computation of all activities affected by the change or delay. The event times used in the analysis shall be those included in the latest update of the Current Record Schedule, in effect at the time the change or delay was encountered.

3. Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total or remaining float along the critical path of activities at the time of actual delay, or at the time the Preliminary Change Order, the Emergency Change Authorization, the Time and Materials Change Order, or the Unilateral Change Order was issued. Float or slack time is not for the exclusive use or benefit of the ENGINEER or the CONTRACTOR but is an expiring resource available to all parties as needed to meet Contract milestones and the Contract completion date. Time extensions shall not be granted nor delay damages paid until;

   a. A delay occurs which is beyond the control and without the fault or negligence of the CONTRACTOR and its SUBCONTRACTORS or SUPPLIERS, at any tier; and

   b. Which extends actual performance of the work beyond the applicable current Contract completion date and the most recent date predicted for completion of the project on the approved schedule update current as of the time of the delay or as of the time of issuance of the Preliminary Change Order, the Emergency Change Authorization, the Time and Materials Change Order, or the Unilateral Change Order.

4. Each Time Impact Analysis shall be submitted in triplicate, within fifteen (15) days after a delay occurs, or issuance of the Preliminary Change Order, Emergency Change Authorization, Time and Materials Change Order, or Unilateral Change Order. If the CONTRACTOR does not submit a Time Impact Analysis for a specific Change Order or delay within the specified period of time, the CONTRACTOR shall be deemed to have irrevocably waived any rights to additional time and cost.

5. Since float time within the Project Schedule and the Record Schedule is jointly owned it is acknowledged and agreed by the CONTRACTOR that CITY caused delays on the project may be offset by CITY caused time savings (including, but not limited to: critical path submittals returned in less time than allowed for in the Contract, approval of substitution requests which result in a savings of time along the critical path for the CONTRACTOR, etc.). In such an event the CONTRACTOR shall not be entitled to receive an extension of time or delay damages until all CITY caused time savings are exceeded and the Contract completion date also exceeded.

6. Approval or rejection of each Time Impact Analysis by the ENGINEER shall be made within fifteen (15) days after receipt of each Time Impact Analysis, unless subsequent meetings and negotiations are necessary. Upon approval, a copy of a Time Impact Analysis signed by the ENGINEER shall be returned to the CONTRACTOR for incorporation into the schedule.

7. Upon mutual agreement by both parties, fragnets illustrating the influence of Change Orders and delays shall be incorporated into the Project Schedule or Record Schedule during the first update after agreement is reached.

8. In the event the CONTRACTOR does not agree with the decision of the ENGINEER regarding the impact of a change or delay, it shall be resolved in accordance with **CLAIMS AND PROTESTS** of these General Conditions.

O. MANPOWER

The CONTRACTOR shall submit with the initial Project Schedule a histogram depicting total project manpower for its own forces and for each of its SUBCONTRACTORS for each month. The histogram shall be based upon and shall be in substantive agreement with the number of shifts and crew sizes in the Project Schedule.

P. CONSTRUCTION EQUIPMENT

The CONTRACTOR shall submit with the initial Project Schedule a tabular report listing each major piece of construction equipment and each major piece of construction equipment for each of its SUBCONTRACTORS for each month. Each major piece of the CONTRACTOR'S and the SUBCONTRACTOR'S equipment shall be separately described, identified, and numbered in the report. The tabular report shall be based upon and in substantive agreement with the number of shifts and crew sizes in the Project Schedule.

Q. SUBMITTAL OF AS BUILT SCHEDULE

As a condition precedent to any release of retention, the last update to the Record Schedule submitted shall be identified by the CONTRACTOR as the "As Built Schedule". The "As Built Schedule" shall reflect the exact manner in which the project was actually constructed (including start and completion dates, activities, sequences, and logic) and shall be signed and certified by the CONTRACTOR'S Project Manager and Construction Scheduler as being a true reflection of the way in which the project was actually constructed.

[NTS: The Specifier shall meet with the Construction Project Engineer and Construction Project Scheduler to determine whether this section of the Article shall be retained or deleted from the project's General Requirements.]

R. RECORDER OF THE SCHEDULE

1. Following the ENGINEER'S approval of the Baseline Project Schedule, the ENGINEER will input the schedule into the ENGINEER'S computer. The ENGINEER will then reproduce the Baseline Project Schedule and transmit it to the CONTRACTOR for verification. The CONTRACTOR shall, within fifteen (15) days of the transmittal, authenticate the schedule, acknowledging that the schedule is, in fact, the CONTRACTOR'S schedule, or advise the ENGINEER in writing of the reason(s) for not authenticating it. Once the schedule has been authenticated, it will be known as the Baseline Record Schedule, and all

performance will be measured against it. The ENGINEER will be the Recorder of the Baseline Record Schedule.

2. The ENGINEER shall also be the Recorder of the monthly updates of the Record Schedule. Revisions and updates to the Record Schedule shall be as described in Paragraphs 21.I and 21.J, and shall be input by the ENGINEER following acceptance of the proposed revision or update. Once a month, on a date selected by the ENGINEER, a copy of the monthly update of the Record Schedule shall be transmitted to the CONTRACTOR for verification. The CONTRACTOR shall, within ten (10) days of transmittal, either authenticate the schedule, acknowledging that the schedule is, in fact, the CONTRACTOR'S schedule, or advise the ENGINEER in writing of the reason(s) for not authenticating it. Once the monthly update is authenticated, it will be known as the Current Record Schedule for the specified month.

3. Once the CONTRACTOR has authenticated the Baseline Record Schedule and the monthly update of the Current Record Schedule these documents will be the only official construction schedules. It shall be further understood that any scheduling effects of delays or Change Orders or any scheduling basis of claims shall be based upon the Current Record Schedules.

4. The provisions of Paragraph 21.R do not relieve the CONTRACTOR of any other requirement of **CONTRACTOR'S CONSTRUCTION SCHEDULE AND REPORTS** of these General Requirements.