

BASELINE CHANGE PROPOSAL (BCP)

1) BCP Number: NuMI - 001		2) BCP Title: Project Rebaseline	
3) Budget Number: 98-G-304		4) Title: Neutrinos at the Main Injector (NuMI)	
5) Date Received (Field Office):		Date Received (Program Office):	
6) Change Designation: Routine	7) BCP Level: Level 0 <input checked="" type="checkbox"/> Level 2 <input type="checkbox"/> Level 1 <input type="checkbox"/> Level 3 <input type="checkbox"/>	8) Directed Change? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	9) Program: SC-22 High Energy Physics Division
10) Point of Contact: Ron Lutha		12) FAX: (630)840-3285	
11) Phone: (630)840-8130		13) Location: CH-FAO	
<p>14) Change Description:</p> <p>The NuMI project is approximately 50 percent complete and has made significant progress since being authorized by Congress in FY 1998. The production of a beam of neutrinos from protons extracted from the Main Injector Accelerator and the examination of those neutrinos at a Near and Far Detector remains the basic specification of the project. It has been, however, a difficult project. The extensive underground excavation in bedrock had not been done previously at Fermilab. The beam power (number of proton per unit of time) on target is higher than for previous Fermilab beams. The depth of the primary target has added complications. The initial baseline seriously underestimated the cost of the underground construction at Fermilab and Soudan. The beamline components were similarly underestimated. The existence of other large high-priority projects at Fermilab, all further along than NuMI/MINOS, made it more difficult to add resources and attention soon enough to identify problems early in the project.</p> <p>The experiment is technically well founded and significantly supports the mission of DOE High Energy Physics program. Several Office of Science reviews and internal reviews have been performed of the NuMI project since November 2000 when serious concerns of negative cost and schedule growth were reported. The most recent review of the project in September 2001 resulted in support of the project's proposed rebaseline increasing the project TEC by \$33.093M from \$76.149M to \$109.242M and delaying the start of operation by 2 years from September 2003 to September 2005. The additional funding will increase the baseline for the Technical Components, the Civil Construction, and Project Management and replenish the project's Contingency. Project tasks remaining to be accomplished: completion of the tunnels and halls, construction of the service buildings and outfitting, construction of the decay pipe, construction of the decay insulation, and installation of the detectors.</p>			
<p>15) Change Justification: (If Directed Change specify authority and documentation)</p> <p>The purpose of the baseline change proposal is to provide \$33.1 million of additional funds and 2 years to complete the project's scope of work. The additional funds and schedule float will:</p> <ul style="list-style-type: none"> ▪ Compensate for the lack of engineering support to the NuMI technical components due to Run II, ▪ Allow more time for installation of the technical components, ▪ Recognize unrecoverable delays in the completion of the Tunnels and Halls subcontract, ▪ Allow for the timely start of the service buildings/outfitting subcontract, and ▪ Provide a cushion if further delays occur. 			
<p>16) Impact of Non-Approval:</p> <p>Non-approval of this BCP will make it impossible to complete the original scope of the project. The project can not be de-scoped and still accomplish the scientific mission of the facility. Therefore, if additional funding and schedule is not provided the project will be terminated.</p>			

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17) BCP Number: NuMI-001		18) BCP Title: Project Rebaseline	
19) Impact on Cost Baseline:	Baseline (As of August 2001)	Proposed *	Change
Estimate without contingency	\$ 75.9M	\$ 93.2M	\$ + 17.3M
Contingency	0.2 (0.2%)	16.0 (15%)	+ 15.8
TEC	\$ 76.1M	\$109.2M	\$ + 33.1M
Other Project Costs	62.2	62.2	+ 0.0
TPC (Total DOE Funds)	\$138.3M	\$171.4M	\$ + 33.1M
* Based on the proposed rebaseline, as of August 31, 2001 the TEC is \$109.2M with \$40.2M costed (43% complete). The Other Project Costs (OPC) is \$62.2M with \$31.2M costed (57% complete) (DOE funds only). The available contingency is 30% of the un-costed TEC estimate and 31% of the un-costed OPC estimate. See Supplemental Sheet 1 for more detail.			
20) Impact on Funding Profile (BA):			
Under the current baseline no TEC funds are provided in FY 2003. Approval of the Baseline Change Proposal will provide TEC funds in FY 2003, FY 2004 and FY 2005. The changes to the funding profile is shown below:			
Baseline (\$M)			
	Prior FY	FY01	FY02
TEC	41.800	22.949	11.400
OPC	19.670	15.382	19.000
TPC	61.470	38.331	30.400
	FY03	FY04	FY05
	0.000	0.000	0.000
	8.148	0.000	0.000
	8.148	0.000	0.000
	Total		
	76.149	62.200	138.349
Proposed (\$M)			
TEC	41.800	22.949	11.400
OPC	19.203	14.062	19.000
TPC	61.003	37.011	30.400
	20.093	12.500	0.500
	7.435	2.000	0.500
	27.528	14.500	1.000
Change in TPC	-0.467	-1.320	0.000
	+19.380	+14.500	+1.000
	+33.093		
21) Explanation of Impact on Cost and Funding Baseline:			
Without additional funds the NuMI project will be unable to complete the scope of the project. The project can not be de-scoped and still accomplished the scientific mission of the facility. The revised funding profile is discussed above in block 20. As of August 31, 2001, the TEC is 43 percent costed and the Other Project Costs are 57 percent costed based on the revised estimate to completion. The September 2001 Office of Science review of the project indicated that the proposed cost baseline is founded on a comprehensive technical scope, sound cost estimating, and adequate assessments of risks and contingency.			
22) Impact on Schedule Baseline:			
Milestone (No. and Description)	Baseline (Month/Year)	Proposed (Month/Year)	Change
CD-4	9/03	9/05	24 months
23) Explanation of Impact on Schedule Baseline:			
The overall impact to the project schedule is a 2-year slip in construction completion and achieving the milestone "Beginning of Operations (CD-4)" from 4Q03 to the 4Q05.			
The critical path for the completion of the NuMI Project is the civil construction at Fermilab and the subsequent installation of the NuMI beam technical components in the target hall area. Supplemental sheet 2 provides the changes to level 0, 1, and 2 milestones. The 2-year extension of the project completion is due to the extended time required for award the contract and the lost time during construction of the Tunnels and Halls plus restoration of project schedule float.			

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24) BCP Number: NuMI - 001		25) BCP Title: Project Rebaseline	
26) Impact on Scope Baseline:			
Item	Baseline	Proposed	Change
WBS 1.0	NuMI Facility TDR, version 1.0 (Oct 98) with Appendix C (9/01)	Same	None
WBS 2.0	MINOS Detectors TDR, version 1.0 (Oct 98) with revised chapters 6 & 7 (May 00)	Same	None
WBS 3.0	MINOS Far Detector Lab. TDR version 1.0 (Oct 98)	Same	None
27) Explanation of Impact on Scope Baseline:			
NONE			
28) Other Impacts (Health, Safety, Environment, etc.)			
<p>The NuMI project has also, been impacted by the following issues:</p> <ul style="list-style-type: none"> • Water treatment to reduce total suspended solids and to regulate the pH of water discharged from the underground Tunnels and Halls site in conformance with the Illinois Mining Permit governing the work was substantially more demanding than assumed in the original estimates of the work. • Several reportable accidents have occurred on the Tunnels and Halls construction also including a Type A Accident Investigation of a sub-tier worker being injured. <p>In response to these issues an ES&H position has been added at the highest level of the Fermilab project management office to oversee and coordinate ES&H efforts. Construction safety oversight has been further strengthened through the inclusion of a dedicated safety professional in the field. Also, the Tunnels and Halls subcontractor has a dedicated safety staff for each construction shift as well as a full time safety professional.</p>			

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29) Interim or Corrective Actions:

Several changes have been made to streamline and strengthen project management, construction management, construction safety, technical manpower and refine the project cost and schedule.

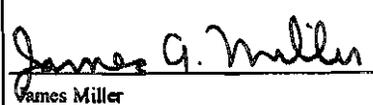
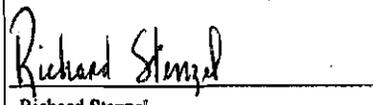
Management of the technical components has been strengthened. Engineering effort has ramped up over the past year to the needed level, and those engineers have been on the project now long enough to provide management with good cost and schedule estimates. Physicists from the laboratory and the MINOS collaboration have been added to the effort as well. The refined estimate process was accompanied by many reviews to ensure that a complete, accurate estimate was prepared. Technical risks have been mitigated by a successful prototype program for both the focusing horn and production target. The refurbishment of existing beamline magnets for use in the project is also complete. Integrated installation schedules have been further developed. Contingency analyses, both top down and bottoms up, using a graded approach based upon design and construction maturity are incorporated in the rebaseline request. Critical tasks have been identified and accounted for in the proposed funding profiles. The staff necessary to complete the work is available for the duration of the project, in accordance with the staffing plan.

Management of the civil construction has been strengthened at Fermilab. A Construction Management Office has been formed for the Tunnels and Halls construction, reporting directly to the Fermilab NuMI Project Manager. The office is fully staffed with a lead engineer manager, deputy manager, procurement staff, and expert consultants in the construction of tunnels and tunnel construction safety. An aggressive claims management process has been put in place, which includes an expert consultant in the settlement of underground construction claims and claim avoidance. A parallel construction management office reporting to the Fermilab NuMI Project Manager has been established for the outfitting and service buildings construction. Detailed integration of work with the technical components is underway which allows for critical engineering in other areas to continue.

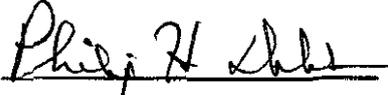
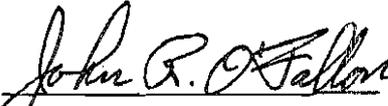
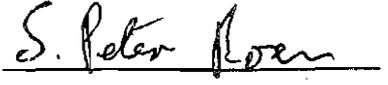
Procurement and ES&H coordination positions have been added at the highest levels of the Fermilab project management office to oversee and coordinate project procurement and ES&H efforts. Construction safety oversight has been further strengthened through the inclusion of a dedicated safety professional in the field.

Factory level component production of the Far Detector is progressing. Installation of the detector at Soudan is in its early stages, but has already validated the installation effort estimates. A test beam program at CERN has been established which is using a fully integrated system of detector production components. No significant problems have been identified. Fabrication of Near Detector components is in progress and pre-assembly of the detector planes on the surface will speed installation underground at Fermilab removing this from the critical path.

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30) BCP Number: NuMI-001	31) BCP Title: Project Rebaseline
FIELD DISPOSITION - LEVEL 2	
32) Members	Recommendations
 _____ John Scott Operational Health & Safety Engineer	_____ Date: 11/8/01
 _____ Jonathan P. Cooper Environmental Scientist	_____ Date: 11/08/01
 _____ Stephen Webster General Engineer	_____ Date: 11/08/01
 _____ James Miller Deputy Area Office Manager	_____ Date: 11/8/01
Advisors	Recommendations
 _____ Jim Yeck LHC Project Manager	_____ Date: 11/08/01
 _____ Richard Stenzel Facility Team Lead	_____ Date: 11/8/01
Disposition <input type="checkbox"/> Approved <input checked="" type="checkbox"/> Endorsed <input type="checkbox"/> Rejected	Comments:
 _____ Ronald J. Lutha, Chairperson DOE/CH-FAO Baseline Change Control Board	_____ Date: 11/8/01

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PROGRAM DISPOSITION - LEVEL 1	
Advisors (Specialized Support, as required)	Recommendations
 <u>Philip H. Debenham</u> <u>11-15-01</u> Philip H. Debenham Date: NuMI Program Manager	Recommend approval
 <u>John R. O'Fallon</u> <u>11/19/01</u> John R. O'Fallon Date: Director, DHEP	Recommend approval
Disposition <input checked="" type="checkbox"/> Approved <input type="checkbox"/> Endorsed <input type="checkbox"/> Rejected  <u>S. Peter Rosen</u> <u>11/19/01</u> S. Peter Rosen Date: Deputy Director, Office of Science	
Disposition <input checked="" type="checkbox"/> Approved <input type="checkbox"/> Endorsed <input type="checkbox"/> Rejected  <u>James F. Decker</u> <u>11/19/01</u> James F. Decker Date: Deputy Director, Office of Science	Comments:

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Supplemental Sheet 1

NEUTRINOS at the MAIN INJECTOR

Project Baseline by WBS Element

WBS ELEMENT	ITEM	CURRENT BASELINE (\$M)	PROPOSED BASELINE (\$M)	CHANGE (M\$)
1.0	TOTAL ESTIMATED COST	76.149	109.242	+ 33.093
1.1	Technical Components	18.656	27.962	+ 9.306
1.2	Civil Construction	54.281	60.493	+ 6.212
1.3	Project Management	3.046	4.788	+ 1.742
	Contingency ⁴	(0.2%) ⁵ 0.166	(30.0%) ⁵ 15.999	+ 15.833
	Other Project Costs	62.200	62.200	0
2.0	U.S. Detector Contribution ¹	38.776	38.776	0
3.0	Project Support ²	16.109	16.109	0
	Contingency	(31.0%) ⁵ 7.315	(31.0%) ⁵ 7.315	0
	TOTAL PROJECT COST (TPC)	138.349 ³	171.442 ³	+ 33.093

1. Does not include United Kingdom contribution of \$6.0 million; includes detector installation funds.

2. Does not include Minnesota State contribution of \$3.8 million.

3. DOE funding.

4. Original baseline (November 1998) included contingency at \$12,865K, 17% of the construction cost.

5. Percent estimate to complete.

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Supplemental Sheet 2

Changes to Level 0, 1, and 2 Milestones

Level 0 Milestones

Milestone No.	Description	Baseline Date	Actual Date	Proposed Date	Change (Months)
L-0-1	CD-1: Approve mission need	03-97	03-17-97		
L-0-2	CD-2: Approve baselines	02-99	02-17-99		
L-0-3	CD-4: Start operations	09-03		09-05	24

Level 1 Milestones

Milestone No.	Description	Baseline Date	Actual Date	Proposed Date	Change (Months)
L-1-1	CD-3a: Start limited construction	02-99	02-23-99		
L-1-2	CD-3b: Continue construction	04-99	05-21-99		
L-1-3	Far detector prototype erected	01-00	11-10-99		
L-1-4	Far detector excavation complete	10-00	12-22-00		
L-1-5	Target hall excavation complete	12-01		12-02	12
L-1-6	Inner and outer conductors for first production horn assembled	11-01		04-03	17
L-1-7	First far-detector super module complete and tested	07-02		03-03	8
L-1-8	Far detector complete and tested	06-03		04-04	10
L-1-9	Start commissioning beamline	New		09-05	
L-1-10	Service building & outfitting bid package out	New		07-02	

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Level 2 Milestones

Milestone No.	Description	Baseline Date	Actual Date	Proposed Date	Change (Months)
L-2-1	MINOS steel purchase subcontract awarded	04-99	03-15-99		
L-2-2	Top of Soudan #8 mineshaft located with GPS	06-99	06-16-99		
L-2-3	NTP issued for Fermilab underground subcontract	03-00	03-06-00		
L-2-4	High current pulse into prototype horn	03-00	07-14-00		
L-2-5	Fermilab underground construction 50% complete	02-01	06-29-01		
L-2-6	CalTech factory commissioned	09-00	09-01-00		
L-2-7	Near detector excavation complete	08-01		12-02	16
L-2-8	Magnets for MI stub refurbished	04-01	04-30-01		
L-2-9	Outfitting of far detector enclosure complete	04-01	07-19-01		
L-2-10	Cosmic rays observed in far detector	09-01	09-03-01		
L-2-11	Beneficial occupancy of service buildings at Fermilab	10-02		05-04	19
L-2-12	Lambertson and C-magnets assembled and tested	04-02		02-03	10
L-2-13	First horn installed	12-02		04-05	28
L-2-14	Near detector complete and tested	08-03		03-05	19
L-2-15	MI stub installation complete	New		03-05	
L-2-16	Technology choice made for muon monitors	New		05-02	
L-2-17	Complete installation of horn power supply	New		09-04	
L-2-18	Target Service Building Shell Complete	New		09-03	
L-2-19	75% scintillator produced	New		08-02	
L-2-20	Near detector plane pre-assembly complete	New		10-03	
L-2-21	Start commissioning with both Near and Far DAQ	New		08-04	