

16:27:18

OCA PAD AMENDMENT - PROJECT HEADER INFORMATION

01/25/96

Active

Project #: D-48-A97                      Cost share #:  
Center # : 10/24-6-R8265-0A0      Center shr #:  
  
Contract#: CMS-9416458                      Mod #: 1  
Prime #:  
  
Subprojects ? : N  
Main project #:

Rev #: 3  
OCA file #:  
Work type : RES  
Document : GRANT  
Contract entity: GTRC  
  
CFDA: 47.041  
PE #: N/A

Project unit:                      DEAN ARCH                      Unit code: 02.010.170  
Project director(s):  
    FRENCH S P                      DEAN ARCH                      (404)894-2350  
    NELSON A C                      SDL                      (404)-

Sponsor/division names: NATL SCIENCE FOUNDATION                      / GENERAL  
Sponsor/division codes: 107                      / 000

Award period:                      940901                      to                      960831 (performance)                      961130 (reports)

Sponsor amount	New this change	Total to date
Contract value	0.00	87,464.00
Funded	0.00	87,464.00
Cost sharing amount		0.00

Does subcontracting plan apply ? : N

Title: ASSESSMENT OF DAMAGE FROM THE 1994 NORTHRIDGE EARTHQUAKE RELATIVE TO ...

PROJECT ADMINISTRATION DATA

OCA contact: Jacquelyn L. Bendall                      894-4820

Sponsor technical contact

Sponsor issuing office

WILLIAM A. ANDERSON  
(703)306-1362

RAMONA M. LAUDA  
(703)306-1218

NATIONAL SCIENCE FOUNDATION  
4201 WILSON BLVD.  
ARLINGTON, VA 22230

NATIONAL SCIENCE FOUNDATION  
4201 WILSON BLVD.  
ARLINGTON, VA 22230

Security class (U,C,S,TS) : U                      ONR resident rep. is ACO (Y/N): N  
Defense priority rating : N/A                      NSF supplemental sheet  
Equipment title vests with: Sponsor                      GIT X

Administrative comments -

AMENDMENT NO. 1 EXTENDS PERIOD OF PERFORMANCE TO AUGUST 31, 1996 WITH THE  
NSF FINAL REPORT DUE NOVEMBER 30, 1994

GEORGIA INSTITUTE OF TECHNOLOGY  
OFFICE OF CONTRACT ADMINISTRATION

NOTICE OF PROJECT CLOSEOUT

Closeout Notice Date 01/02/97

Project No. D-48-A97\_\_\_\_\_ Center No. 10/24-6-R8265-0A0\_

Project Director FRENCH S P\_\_\_\_\_ School/Lab DEAN ARCH\_\_\_\_\_

Sponsor NATL SCIENCE FOUNDATION/GENERAL\_\_\_\_\_

Contract/Grant No. CMS-9416458\_\_\_\_\_ Contract Entity GTRC

Prime Contract No. \_\_\_\_\_

Title ASSESSMENT OF DAMAGE FROM THE 1994 NORTHRIDGE EARTHQUAKE RELATIVE TO ...

Effective Completion Date 960831 (Performance) 961130 (Reports)

Closeout Actions Required:	Y/N	Date Submitted
Final Invoice or Copy of Final Invoice	N	_____
Final Report of Inventions and/or Subcontracts	N	_____
Government Property Inventory & Related Certificate	N	_____
Classified Material Certificate	N	_____
Release and Assignment	N	_____
Other _____	N	_____

Comments \_\_\_\_\_  
LETTER OF CREDIT APPLIES. 98A SATISFIES PATENT REPORT. \_\_\_\_\_

Subproject Under Main Project No. \_\_\_\_\_

Continues Project No. \_\_\_\_\_

Distribution Required:

Project Director	Y
Administrative Network Representative	Y
GTRI Accounting/Grants and Contracts	Y
Procurement/Supply Services	Y
Research Property Management	Y
Research Security Services	N
Reports Coordinator (OCA)	Y
GTRC	Y
Project File	Y
Other _____	N
_____	N



Home of the 1996 Olympic Village

# Georgia Institute of Technology

City Planning Program  
College of Architecture

D-48-A97  
1

17 December 1996

Dr. William A. Anderson - CMS  
National Science Foundation  
4201 Wilson Blvd.  
Arlington, VA 22230

Dear Bill:

Enclosed please find the final report on my project "Assessment of Damage from the 1994 Northridge Earthquake Relative to Planning since the 1971 San Fernando Earthquake" (CMS-9416458). Some of the relationships were not as straightforward as I had expected, but I think it was an interesting and worthwhile project.

Have a very Merry Christmas. I hope to see you in July.

Best regards,

Steven P. French, Director  
City Planning Program and  
Center for Geographic Information Systems

SPF/jhg  
Encl.

City Planning Program  
College of Architecture  
Atlanta, Georgia 30332-0155 U.S.A.  
PHONE 404-894-2350  
FAX 404-894-1628

NATIONAL SCIENCE FOUNDATION  
4201 Wilson Blvd.,  
Arlington, VA 22230

BULK RATE  
POSTAGE & FEES PAID  
National Science Foundation  
Permit No. G-69

## PI/PD Name and Address

Steven P. French  
College of Architecture  
DATA NOT AVAILABLE  
Atlanta

AUG 29 1998

GA 30332 -

0155

# NATIONAL SCIENCE FOUNDATION FINAL PROJECT REPORT

**PART I - PROJECT IDENTIFICATION INFORMATION**

1. Program Official/Org.	William A. Anderson - CMS		
2. Program Name	EARTHQUAKE HAZARD MITIGATION PROGRAM		
3. Award Dates (MM/YY)	From:	09/94	To: 08/96
4. Institution and Address	GA Tech Res Corp - GIT Administration Building Atlanta GA 30332		
5. Award Number	9416453		
6. Project Title	Assessment of Damage From the 1994 Northridge Earthquake Relative to Planning Since the 1971 San Fernando Earthquake		

\*\* You are encouraged to submit your Final Project Report electronically \*\*  
\*\* through the NSF FastLane home page ([www.fastlane.nsf.gov](http://www.fastlane.nsf.gov)). \*\*

This Packet Contains  
NSF Form 98A  
And 1 Return Envelope



NSF Grant Conditions (Article 17, GC-1, and Article 9, FDP-11) require submission of a Final Project Report (NSF Form 98A) to the NSF program officer no later than 90 days after the expiration of the award. Final Project Reports for expired awards must be received before new awards can be made (NSF Grants Policy Manual Section 677).

Below, or on a separate page attached to this form, provide a summary of the completed projects and technical information. Be sure to include your name and award number on each separate page. See below for more instructions.

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## PART II - SUMMARY OF COMPLETED PROJECT (for public use)

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The summary (about 200 words) must be self-contained and intelligible to a scientifically literate reader. Without restating the project title, it should begin with a topic sentence stating the project's major thesis. The summary should include, if pertinent to the project being described, the following items:

- The primary objectives and scope of the project
- The techniques or approaches used only to the degree necessary for comprehension
- The findings and implications stated as concisely and informatively as possible

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## PART III - TECHNICAL INFORMATION (for program management use)

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List references to publications resulting from this award and briefly describe primary data, samples, physical collections, inventions, software, etc. created or gathered in the course of the research and, if appropriate, how they are being made available to the research community. Provide the NSF Invention Disclosure number for any invention.

I certify to the best of my knowledge (1) the statements herein (excluding scientific hypotheses and scientific opinion) are true and complete, and (2) the text and graphics in this report as well as any accompanying publications or other documents, unless otherwise indicated, are the original work of the signatories or of individuals working under their supervision. I understand that willfully making a false statement or concealing a material fact in this report or any other communication submitted to NSF is a criminal offense (U.S. Code, Title 18, Section 1001).

	16 Dec 1996
Principal Investigator/Project Director Signature	Date

**IMPORTANT:  
MAILING INSTRUCTIONS**

**Return this *entire* packet plus all attachments in the envelope attached to the back of this form. Please copy the information from Part I, Block I to the *Attention block* on the envelope.**

Steven P. French, Principal investigator  
CMS-9416458

## **Part II. Project Summary**

Land use planning for seismic safety has been mandated in California for more than twenty years. The Northridge earthquake significantly impacted nineteen jurisdictions with adopted seismic safety elements. This event provided a unique opportunity to assess the effectiveness of land use planning as a mitigation strategy for earthquake hazards.

The quality and content of the plans in the Northridge area varies considerably. Some have detailed fact bases, clearly articulated goals and stringent policies on the type and location of development allowed. Others are quite weak on one or more of these dimensions. This research project investigated the relationship between various aspects of plan quality with the damage caused by the Northridge earthquake.

To fully understand the value of the land use plan as a hazard mitigation tool, we needed to control for other factors that are known to affect the amount and type of damage. A multiple regression approach was used to control various aspects of the hazard and the building stock so that the effect of land use planning could be seen.

The analysis found that land use planning had a small, but measurable effect in reducing damage from the Northridge earthquake. The hazard delineation and public awareness components of the plans were the most strongly related to lower damage levels. A disproportionate amount of damage was found in areas that were identified as likely liquefaction areas. Those communities that included detailed mapping of these areas experienced less damage than their neighbors. Additional research is needed to fully understand the implementation of development management regulations.

## **Part III. Technical Information**

Attached Final Report

Article in preparation for *Journal of the American Planning Association*

Article in preparation for *Earthquake Spectra*

Article in Preparation for *Environment and Planning A*

Conference presentation, Natural Hazards Workshop, Boulder Colorado, July 1995

Conference presentation, Mitigation of Urban Earthquake Disasters: Learning from Kobe and Northridge, December 1995

Conference presentation, EERI Economic Impact of Earthquakes Conference, October 1996

# PART IV -- FINAL PROJECT REPORT -- SUMMARY DATA ON PROJECT PERSONNEL

(To be submitted to cognizant Program Officer upon completion of project)

The data requested below are important for the development of a statistical profile on the personnel supported by Federal grants. The information on this part is solicited in response to Public Law 99-383 and 42 USC 1885C. All information provided will be treated as confidential and will be safeguarded in accordance with the provisions of the Privacy Act of 1974. You should submit a single copy of this part with each final project report. However, submission of the requested information is not mandatory and is not a precondition of future award(s). Check the "Decline to Provide Information" box below if you do not wish to provide the information.

Please enter the numbers of individuals supported under this grant.  
Do not enter information for individuals working less than 40 hours in any calendar year.

	Senior Staff		Post-Doctorals		Graduate Students		Under-Graduates		Other Participants <sup>1</sup>	
	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.
<b>A. Total, U.S. Citizens</b>	2				2	2			1	
<b>B. Total, Permanent Residents</b>										
U.S. Citizens or Permanent Residents <sup>2</sup> :										
American Indian or Alaskan Native . . . .										
Asian . . . . .										
Black, Not of Hispanic Origin . . . . .										
Hispanic . . . . .										
Pacific Islander . . . . .										
White, Not of Hispanic Origin . . . . .	2				2	2			1	
<b>C. Total, Other Non-U.S. Citizens</b>					2	1				
Specify Country										
1. India					2					
2. China						1				
3.										
<b>D. Total, All participants (A + B + C)</b>	2				4	3			1	
<b>Disabled<sup>3</sup></b>										

☐ Decline to Provide Information: Check box if you do not wish to provide this information (you are still required to return this page along with Parts I-III).

<sup>1</sup> Category includes, for example, college and precollege teachers, conference and workshop participants.

<sup>2</sup> Use the category that best describes the ethnic/racial status for all U.S. Citizens and Non-citizens with Permanent Residency. (If more than one category applies, use the one category that most closely reflects the person's recognition in the community.)

<sup>3</sup> A person having a physical or mental impairment that substantially limits one or more major life activities; who has a record of such impairment; or who is regarded as having such impairment. (Disabled individuals also should be counted under the appropriate ethnic/racial group unless they are classified as "Other Non-U.S. Citizens.")

**AMERICAN INDIAN OR ALASKAN NATIVE:** A person having origins in any of the original peoples of North America and who maintains cultural identification through tribal affiliation or community recognition.

**ASIAN:** A person having origins in any of the original peoples of East Asia, Southeast Asia or the Indian subcontinent. This area includes, for example, China, India, Indonesia, Japan, Korea and Vietnam.

**BLACK, NOT OF HISPANIC ORIGIN:** A person having origins in any of the black racial groups of Africa.

**HISPANIC:** A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race.

**PACIFIC ISLANDER:** A person having origins in any of the original peoples of Hawaii; the U.S. Pacific territories of Guam, American Samoa, and the Northern Marianas; the U.S. Trust Territory of Palau; the islands of Micronesia and Melanesia; or the Philippines.

**WHITE, NOT OF HISPANIC ORIGIN:** A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

*City Planning Program  
College of Architecture*

# **THE NORTHRIDGE EARTHQUAKE: LAND USE PLANNING FOR HAZARD MITIGATION**

**Steven P. French  
Arthur C. Nelson  
S. Muthukumar  
Maureen M. Holland**

**Final Report to the  
National Science Foundation  
CMS - 9416458**

--160 page report--

*Georgia Institute of Technology*