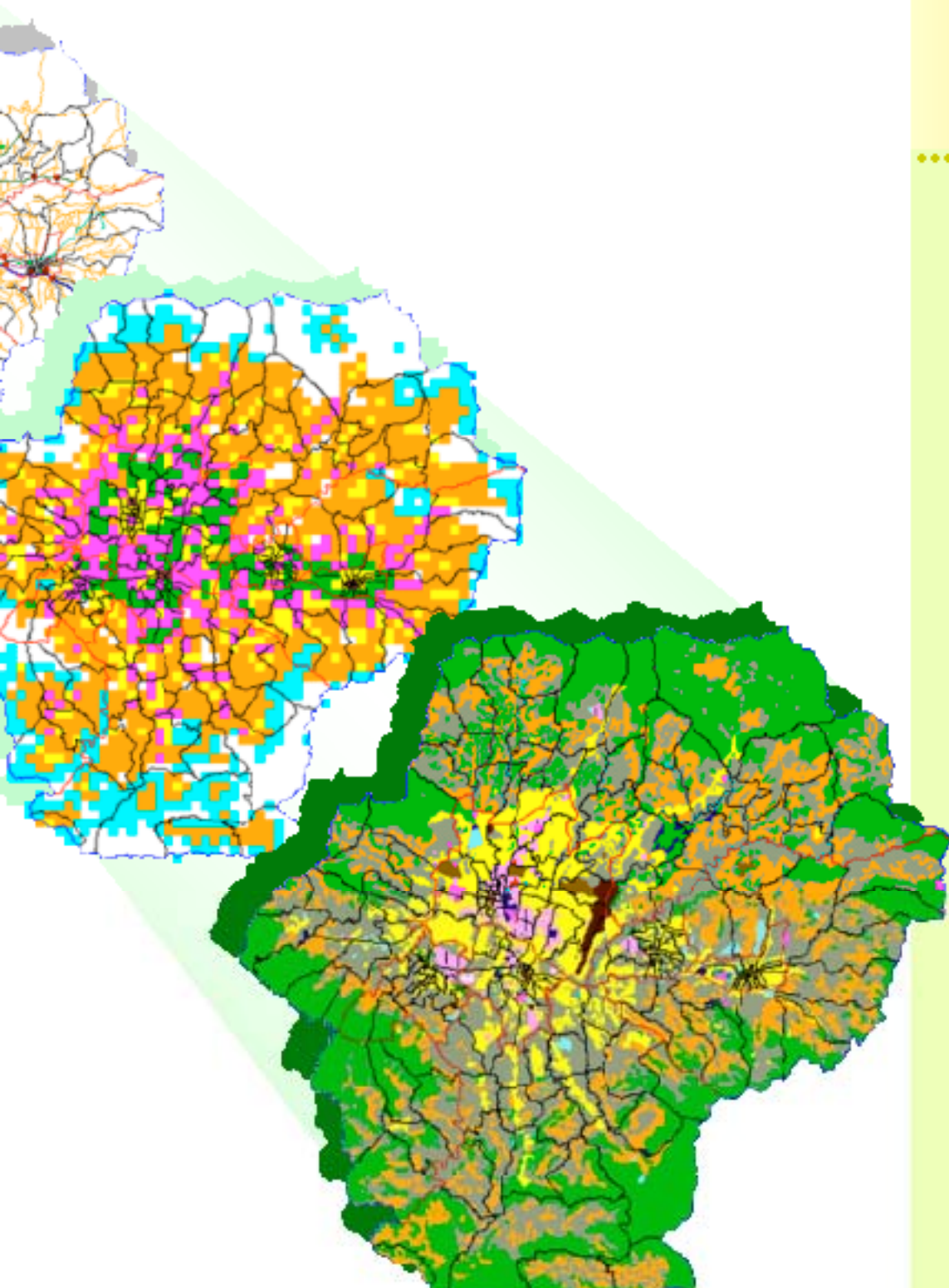


JICA Japan International Cooperation Agency (JICA)



Ministry of Home Affairs, HMG of Nepal



No.



The Study on Earthquake Disaster Mitigation

In the Kathmandu Valley
Kingdom of Nepal

Final Report

Vol. I II III IV V

MAIN REPORT (III)

**Earthquake Disaster
Assessment and
Database System**

March, 2002

Nippon Koei Co., LTD.
Oyo Corporation

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02-83

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF HOME AFFAIRS, HIS MAJESTY'S GOVERNMENT OF NEPAL

**THE STUDY
ON
EARTHQUAKE DISASTER MITIGATION
IN
THE KATHMANDU VALLEY, KINGDOM OF NEPAL**

FINAL REPORT

VOLUME III

MAIN REPORT (2/2)

**EARTHQUAKE DISASTER ASSESSMENT
AND
DATABASE SYSTEM**

MARCH, 2002

NIPPON KOEI CO., LTD.
OYO CORPORATION

Composition of the Final Report

Volume I : SUMMARY

Volume II : MAIN REPORT (1/2)

BLUEPRINT FOR KATHMANDU VALLEY EARTHQUAKE DISASTER MITIGATION

Volume III : MAIN REPORT (2/2)

EARTHQUAKE DISASTER ASSESSMENT AND DATABASE SYSTEM

Volume IV: APPENDIX

Volume V: SUMMARY in Japanese

Currency Exchange Rates Adopted for the Study

US\$ 1.00	=	NRs. 75.49
NRs. 1.00	=	¥ 1.65

October, 2001

Table of Contents

	<u>page</u>
CHAPTER 1 EARTHQUAKE DISASTER ASSESSMENT	1
1.1 Introduction	1
1.2 Earthquake	2
1.2.1 Seismicity	2
1.2.2 Lineament in the Kathmandu Valley	5
1.2.3 Scenario Earthquake Model	6
1.3 Ground Classification	8
1.3.1 Regional Geology	9
1.3.2 Ground Model	10
1.3.3 Soil Properties of the Ground Model	12
1.4 Earthquake Motion	14
1.4.1 Analysis Method	14
1.4.2 Acceleration at Engineering Seismic Bedrock	15
1.4.3 Amplification of Subsurface Ground	17
1.4.4 Peak Ground Acceleration and Seismic Intensity	18
1.5 Liquefaction	20
1.5.1 Analysis Method	20
1.5.2 Groundwater Model	21
1.5.3 Liquefaction Potential	21
1.6 Slope Stability	22
1.7 Fundamental Social Data	23
1.7.1 Administrative Boundary	23
1.7.2 Locality Classifications	24
1.7.3 Population and Households	25
1.7.4 Land Use	27
1.8 Damage to Buildings	29
1.8.1 Inventory	29
1.8.2 Preparation of Fragility Curves	34
1.8.3 Damage Estimation	37
1.9 Damage to Major Public Facilities	39
1.9.1 Schools	40
1.9.2 Hospitals	42
1.9.3 Fire Stations	43
1.10 Casualties	44
1.10.1 Analysis Method	44
1.10.2 Estimation of Casualties	46
1.10.3 Validation	47

1.11	Damage to Roads and Bridges	48
1.11.1	Bridges	48
1.11.2	Roads	50
1.11.3	Accessibility	52
1.12	Damage to Lifeline Facilities	52
1.12.1	Water Supply Pipelines	52
1.12.2	Sewerage	55
1.12.3	Electric Power Supply	56
1.12.4	Telecommunications	58
1.13	Fire.....	59
CHAPTER 2 DATABASE SYSTEM.....		63
2.1	Objectives	63
2.2	Design	63
2.3	Specifications	64
2.4	Functions.....	65
2.5	Operation Manual.....	66
2.6	Contents	70
CHAPTER 3 WEBSITE		71
CHAPTER 4 RECOMMENDATION ON HAZARD ASSESSMENT		72
CHAPTER 5 REFERENCES.....		73

List of Tables

Table 1.2.1	List of Earthquakes near Kathmandu	4
Table 1.2.2	Damage by 1833. 8. 26 Earthquake	4
Table 1.2.3	Damage by the 1934.1.15 Bihar-Nepal Earthquake	4
Table 1.2.4	Damage by the 1988.8.20 Udayapur Earthquake	4
Table 1.2.5	Scenario Earthquake Fault Model Parameters	8
Table 1.3.1	Geomorphologic Feature in the Study Area	11
Table 1.3.2	Typical Geological Sections	T 1
Table 1.3.3	Soil Properties of the Ground Model	12
Table 1.3.4	Relation between N value and Depth	12
Table 1.3.5	Mean Particle Size and Fine Content	12
Table 1.3.6	Density of Materials	13
Table 1.4.1	Ground Condition Applicability of Attenuation Formula	16
Table 1.4.2	Example of Ground Model for Response Analysis (Ground model No.82)	17
Table 1.6.1	Terrace Surface and Relative Height	22
Table 1.6.2	Possibility of Slope Failure	23
Table 1.6.3	Characteristics of Slope Failure in the Mountainous Area	23
Table 1.7.1	Administrative Classification	24
Table 1.7.2	Population and Household Projection in the Kathmandu Valley	26
Table 1.7.3	Land Use in the Kathmandu Valley	27
Table 1.7.4	Kathmandu Metropolitan City Land Use in 1995	29
Table 1.8.1	Number of Samples according to Locality Classification	30
Table 1.8.2	Percentage of Building by Type	31
Table 1.8.3	Analytical Result of Damage to Buildings by 1988.8.20 Earthquake	35
Table 1.8.4	Existing and Calibrated Fragility Curves	36
Table 1.8.5	Outline of Building Damage Estimation	38
Table 1.8.6	Estimated Damage of Residential Buildings	38
Table 1.9.1	Number of Public Schools in the Kathmandu Valley	40
Table 1.9.2	Inventory of Public Schools in the Kathmandu Valley	41
Table 1.9.3	Damage of Schools	41
Table 1.9.4	Inventory of Hospitals in the Kathmandu Valley	42
Table 1.9.5	Damage of Hospitals	43
Table 1.9.6	Damage of Fire Stations	43
Table 1.10.1	Definition of Casualty Estimation	46
Table 1.10.2	Estimated Casualties	46
Table 1.11.1	Results of Damage Analysis for Bridges	50
Table 1.11.2	Applied Road Widths	51
Table 1.12.1	Definition of Pipeline Damage Estimation	55

Table 1.12.2	Estimated Damage of Water Supply Pipelines	55
Table 1.12.3	Definition of Sewerage Damage Estimation	56
Table 1.12.4	Estimated Damage of Sewage Pipelines	56
Table 1.12.5	Definition of Damage Estimation of Power Supply Lines	58
Table 1.12.6	Estimated Damage of Electric Power Supply Lines	58
Table 1.12.7	Definition of Damage Estimation of Telecommunication Lines	59
Table 1.12.8	Estimated Damage of Telecommunication Lines	59
Table 1.31.1	Number of Fire in the Fiscal Year 2000 at the Kathmandu Valley	60
Table 2.3.1	Factors of “Modified UTM” Coordinate System	64
Table 2.3.2	ID No. of Municipal Ward and VDC	65
Table 2.3.3	Actual ID No. List of Municipal Wards and VDCs	T 2
Table 2.4.1	Contents of ‘View/ Query’ Function	T 3
Table 2.6.1	Contents of the Database (1/4)	T 4
Table 2.6.2	Contents of the Database (2/4)	T 5
Table 2.6.3	Contents of the Database (3/4)	T 6
Table 2.6.4	Contents of the Database (4/4)	T 7

List of Figures

Figure 1.2.1	Hazardous Earthquake along Himalaya	3
Figure 1.2.2	Epicentral Distribution around Nepal from 1255 to 2001	3
Figure 1.2.3	Danger Zone around Himalayan Region	5
Figure 1.2.4	Faults and Lineaments in the Kathmandu Valley	6
Figure 1.2.5	Scenario Earthquake Fault Model	8
Figure 1.3.1	Geo-technical Zones of Nepal and Surrounding Area	9
Figure 1.3.2	Geological Map of the Kathmandu Valley	9
Figure 1.3.3	Geologic Section of the Kathmandu Valley	10
Figure 1.3.4	Locations of Boreholes	10
Figure 1.3.5	Ground Model for Seismic Analysis	11
Figure 1.3.6	Relation between N Value and Shear Wave Velocity	13
Figure 1.4.1	Flowchart for Earthquake Motion Analysis	14
Figure 1.4.2	Comparison of Several Attenuation Formula	F 1
Figure 1.4.3	Relation between PGA and Distance	17
Figure 1.4.4	Amplification of Subsurface Layer	18
Figure 1.4.5	Peak Ground Acceleration Distribution (1/2)	F 2
Figure 1.4.6	Peak Ground Acceleration Distribution (2/2)	F 3
Figure 1.4.7	Relation between PGA and MMI by Trifunac and Brady (1975)	19
Figure 1.4.8	Seismic Intensity Distribution (1/2)	F 4
Figure 1.4.9	Seismic Intensity Distribution (2/2)	F 5
Figure 1.5.1	Flowchart of Liquefaction Analysis	20
Figure 1.5.2	Groundwater Table Distribution	21
Figure 1.5.3	Liquefaction Potential Distribution (1/2)	F 6
Figure 1.5.4	Liquefaction Potential Distribution (2/2)	F 7
Figure 1.6.1	Slope Stability	F 8
Figure 1.7.1	Administrative Boundary and Locality Classification	24
Figure 1.7.2	Population in Ward and VDC	26
Figure 1.7.3	Population Density in Ward and VDC	26
Figure 1.8.1	Classification Map showing Predominant Building Type	32
Figure 1.8.2	Frequency of Building Types in Each Locality	33
Figure 1.8.3	Building Type by Age	33
Figure 1.8.4	Damage to Wall in Each Type of Building	34
Figure 1.8.5	Existing Fragility Curves for Building Damage	35
Figure 1.8.6	Fragility Curves Used in the Study	37
Figure 1.8.7	Heavily Damaged Building Number Distribution (1/2)	F 9
Figure 1.8.8	Heavily Damaged Building Number Distribution (2/2)	F 10
Figure 1.8.9	Heavily Damaged Building Ratio Distribution (1/2)	F 11
Figure 1.8.10	Heavily Damaged Building Ratio Distribution (2/2)	F 12

Figure 1.9.1	Public Schools in the Kathmandu Valley	41
Figure 1.9.2	Structure Type ratio of School, Residential Building and Hospital	42
Figure 1.9.3	Hospitals in the Kathmandu Valley	43
Figure 1.9.4	Fire Stations in the Kathmandu Valley	44
Figure 1.10.1	Empirical Relation of Building Damage and Death Toll in Nepal	45
Figure 1.10.2	Empirical relation between Death Toll and Injured in Nepal	45
Figure 1.10.3	Death Toll Density Distribution (1/2)	F 13
Figure 1.10.4	Death Toll Density Distribution (2/2)	F 14
Figure 1.10.5	Total Casualty Density Distribution (1/2)	F 15
Figure 1.10.6	Total Casualty Density Distribution (2/2)	F 16
Figure 1.10.7	Death Toll Distribution (1/2)	F 17
Figure 1.10.8	Death Toll Distribution (2/2)	F 18
Figure 1.10.9	Relationship between Building Damages and Human Casualty	F 19
Figure 1.11.1	Location of Bridges	F 20
Figure 1.11.2	Bridge Damage Distribution -Mid Nepal Earthquake-	F 21
Figure 1.11.3	Road Network	F 22
Figure 1.11.4	Hazardous Points of Roads	F 23
Figure 1.11.5	Accessibility of Roads -Mid Nepal Earthquake-	F 24
Figure 1.12.1	Water Supply Network	F 25
Figure 1.12.2	Damage Function of Water Supply Pipelines by PGA	54
Figure 1.12.3	Damage of Water Supply Pipelines	F 26
Figure 1.12.4	Sewerage Network	F 27
Figure 1.12.5	Damage of Sewerage Pipelines	F 28
Figure 1.12.6	Electric Power Supply Network	F 29
Figure 1.12.7	Damage Function of Power Supply Lines by PGA	57
Figure 1.12.8	Damage of Electric Power Supply Lines	F 30
Figure 1.12.9	Telecommunication Network	F 31
Figure 1.12.10	Damage of Telecommunication Lines	F 32
Figure 1.13.1	Gas Centres and Petroleum Stations in the Kathmandu Valley	61
Figure 1.13.2	Fire Outbreak Rank by Petrol/ Gas Station	F 33
Figure 2.2.1	Design of the System	F 34
Figure 2.3.1	Mesh Configuration (1/2)	F 35
Figure 2.3.2	Mesh Configuration (2/2)	F 36
Figure 2.5.1	Main Menu of KERMIT	67
Figure 2.5.2	Example of “Natural / Social Conditions” sub-menu and “Land Use” Result	68
Figure 2.5.3	Parameter Setting for “New Simulation” Sub-menu	69
Figure 2.5.4	Example Picture from “Video” Menu	69
Figure 3.1.1	Top Page of the Website	71

Abbreviation

ACCL	Apla Consultant Co., Ltd.
AD	Adobe Structure
ADB	Asian Development Bank
AIGP	Additional Inspector General of Police
ATC	Applied Technology Council
BC	Brick with cement mortar
BDS	Bulk Distribution System
BJPY	Billion Japanese Yen
BM	Brick with mud mortar
BNRs	Billion Nepal Rupee
BOT	Build Operate and Transfer
BPC	Butwal Power Company
CBD	Central Business District
CBO	Community Based Organization
CDOs	Chief District Officers
CDR	City Diagnostic Report
C(N)DRC	Central (Natural) Disaster Relief Committee
CNPS	Central Nepal Power System
D(N)DRC	District (Natural) Disaster Relief Committee
DHM	Department of Hydrology and Meteorology
DIG	Disaster Imagination Games
DMC	Disaster Management Committee
DMG	Department of Mines and Geology
DMO	Directorate of Military Operations
DNCMD	Department of Narcotics Control and Disaster Management
DOAD	Department of Agricultural Development
DOI	Department of Irrigation
DOL	Department of Labour
DOR	Department of Roads
DOSCE	Department of Soil Conservation
DPTC	Water Induced Disaster Prevention Technical Center
DR	District Roads
DRCS	Digital Radio Concentrating System
DWIDP	Department of Water Induced Disaster Prevention
EC	European Community
ECB	Emergency Control Board
EMT	Emergency Medical Technician
EOC	Emergency Operation Center
FINNIDA	Finnish International Development Agency
FM	Frequency Modulation
FNCCI	Federation of Nepal Chamber of Commerce and Industry
FR	Feeder Roads
gal	(Earth Gravity: cm/sec/sec)
GDP	Gross Domestic Products
GIS	Geographic Information System
HF	High Frequency
HMG	His Majesty's Government
ICIMOD	International Centre for Integrated Mountain Development
IDA	International Development Association
IDNDR	International Decade for Natural Disaster Reduction
INGO	International Non-Government Organization
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KERMIT	Kathmandu Valley Earthquake Risk Mitigation Tool
KMC	Kathmandu Metropolitan City
KUDP	Kathmandu Valley Urban Development Project
KV	Kathmandu Valley
KVDMC	Kathmandu Valley Disaster Management Council
KVMP	Kathmandu Valley Mapping Programme
KVTDC	Kathmandu Valley Town Development Council
LDC	Load Dispatching Center
LDC	Least Developed Countries
L(N)DRC	Local (Natural) Disaster Relief Committee
LPS	Land Pooling Scheme

LSI	Large Scale Integrated Circuit
MARTS	Multiple Access Radio Transmission System
MCA	Multi-Channel Access
MHPP	Ministry of Agriculture
MHz	Mega Hertz
MJPY	Million Japanese Yen
MLD	Million Litres per Day
MMI	Modified Mercalli Intensity
MNRs	Million Nepal Rupee
MOA	Ministry of Agriculture
MOEC	Ministry of Education and Culture
MOF	Ministry of Finance
MOFA	Ministry of Foreign Affairs
MOFSC	Ministry of Forest and Soil Conservation
MOHA	Ministry of Home Affairs
MOHe	Ministry of Health
MOI	Ministry of Industry
MOIC	Ministry of Information and Communication
MOLD	Ministry of Local Development
MOLJ	Ministry of Law and Justice
MOPE	Ministry of Population & Environment
MOWR	Ministry of Water Resources
MPPW	Ministry of Physical Planning and Works
MWSDB	Melamchi Water Supply Development Board
NARL	Nepal Amateur Radio League
NASC	Nepal Administrative Staff College
NBC	National Building Code of Nepal
NCC	National Cadet Corps
NDF	Nonproliferation and Disarmament Fund
NDMC	National Disaster Management Council
NEA	Nepal Electricity Authority
NEA	Nepal Engineering Association
NEPECON	Nepal Engineering Consultancy Services Center Ltd.
NFC	Nepal Food Corporation
NGO	Non-Government Organization
NGS	Nepal Geological Society
NH	National Highway
NORAD	North American Air Defence Command
NPC	National Planning Commission
NRCS	Nepal Red Cross Society
NSC	National Seismological Center
NSET	National Society for Earthquake Technology
NTC	Nepal Telecommunication Cooperation
NWSC	Nepal Water Supply Corporation
ODA	Official Development Assistance
OPEC	Organization of Petroleum Exporting Countries
PGA	Peak Ground Acceleration
PIP	Priority Investment Plan
PSTN	Public Subscriber Telephone Network
RC	Reinforced Concrete
R(N)DRC	Regional (Natural) Disaster Relief Committee
RNA	Royal Nepal Army
RTSC	Relief and Treatment Sub-Committee
SDH	Synchronous Digital Hierarchy
SOP	Standard Operation Procedures
SSRSC	Supply, Shelter and Rehabilitation Sub-Committee
ST	Stone Structure
SWC	Social Welfare Council
TESU	Traffic Engineering and Safety Unit
TIA	Trivuban International Airport
TU	Tribhuvan University
UHF	Ultra High Frequency
UN	United Nations
UNDP	United Nations Development Program
UR	Urban Roads
USA	United States of America

USAID/OFDA	U.S. Assistance for International Development/Office of Foreign Disaster Assistance
UTM	Universal Transverse Mercator
VDC	Village Development Committees
VHF	Very High Frequency
V-SAT	Very Small Aperture Terminal
WECS	Water and Energy Commission Secretariat
WHO	World Health Organization
WIL	Wireless Loop

Conversion Factors

Length (1)

m	cm	yard	ft	inch
1	100	1.09361	3.28084	39.370
0.01	1	0.010936	0.032803	0.39370
0.91440	91.4400	1	3	36
0.30480	30.480	0.33333	1	12
0.02540	2.54000	0.02778	0.08333	1

Length (2)

km	nautical mile (nm)	yard	mile
1	0.5400	1093.61	0.62137
1.852	1	2026.67	1.1515
0.000914	-	1	-
1.60934	0.869	1760	1

Area (1)

m ²	cm ²	ft ²	in ²
1	10000	10.764	1550
0.09290	929.0	1	144.0
0.0001	1	0.001076	0.1550
0.0006452	6.4516	0.006944	1

Area (2)

ha	km ²	acre	mile ²
1	0.0100	2.471	0.00386
100	1	247.10	0.3861
0.4047	0.004047	1	0.001563
259	2.590	640	1

Volume

in ³	U.S. gallon	Imperial gallon	ft ³	m ³	acre-ft
1	0.00433	0.00361	5.79×10^{-4}	1.64×10^{-5}	1.33×10^{-8}
231	1	0.833	0.134	0.00379	3.07×10^{-6}
277	1.20	1	0.161	0.00455	3.68×10^{-6}
1728	7.48	6.23	1	0.0283	2.30×10^{-5}
61,000	264	220	35.3	1	8.11×10^{-4}
7.53×10^7	3.26×10^5	2.71×10^5	43,560	1230	1

Discharge

U.S. gallon/day (gpd)	ft ³ /day	U.S. gal/min	Imperial gpm	acre-ft/day	ft ³ /sec (cfs)	m ³ /sec
1	0.134	6.94×10^{-4}	5.78×10^{-4}	3.07×10^{-6}	1.55×10^{-6}	4.38×10^{-8}
7.48	1	5.19×10^{-3}	4.33×10^{-3}	2.30×10^{-5}	1.16×10^{-5}	3.28×10^{-7}
1440	193	1	0.833	4.42×10^{-3}	2.23×10^{-3}	6.31×10^{-5}
1728	231	1.20	1	5.31×10^{-3}	2.67×10^{-3}	7.57×10^{-5}
3.26×10^5	43,560	226	188	1	0.504	0.0143
6.46×10^5	86,400	449	374	1.98	1	0.0283
2.28×10^7	3.05×10^6	15,800	13,200	70.0	35.3	1

Weight

kg	t	oz	lb	short ton	long ton
1	0.001	35.27	2.2046	0.00110	9.8420×10^{-4}
1000	1	3.527×10^4	2204.6	1.1023	0.984
0.02835	2.835×10^{-5}	1	0.06250	3.125×10^{-5}	2.790×10^{-5}
0.4536	4.536×10^{-3}	16	1	0.0005	4.464×10^{-4}
907.2	0.9072	32.000×10^3	2.000×10^3	1	0.8529
1016	1.016	3.584×10^4	2.240×10^3	1.12	1

Velocity

m/sec	km/hr	ft/sec	mile/hr	kn
1	3.600	3.2808	2.237	1.9438
0.2778	1	0.9113	0.6214	0.5400
0.3048	1.0973	1	0.6818	0.5925
0.4470	1.6093	1.4667	1	0.8690
0.5144	1.8520	1.6878	1.1508	1

Density (c.g.s. Unit)

gr/cc	kg/m ³ =(gr/l)	gr/m ³	lb/ft ³	oz/ft ³
1	1×10^3	1×10^6	62.43	998.8
0.001	1	1×10^3	0.06243	0.9988
1×10^{-6}	1×10^{-3}	1	6.243×10^{-5}	9.988×10^{-4}
0.016018	16.018	1.6018×10^4	1	16
0.0010012	1.0012	1.0012×10^3	0.0625	1

Pressure

MPa =(N/mm ²)	Pa =(N/m ²)	bar	kgf/cm ²	atm	mmH ₂ O	mmHg
1	1×10^6	10	10.197	9.8692	1.0197×10^5	7500.617
1×10^{-6}	1	1×10^{-5}	1.0197×10^{-5}	9.8692×10^{-6}	0.1019716	7.5006×10^{-3}
0.1	1×10^5	1	1.019716	0.9869233	1.0197×10^4	750.0617
0.0980665	98066.5	0.980665	1	0.9678411	1×10^4	735.5593
0.101325	101325	1.01325	1.03323	1	1.0332×10^4	760
9.8067×10^{-6}	9.80665	9.806×10^{-5}	1×10^{-4}	9.6784×10^{-5}	1	7.3555×10^{-2}
1.3332×10^{-4}	133.3224	1.3332×10^{-3}	1.3595×10^{-3}	1.3158×10^{-3}	13.59510	1