

TABLE OF CONTENTS

LIST OF FIGURES.....	iv
LIST OF TABLES.....	v
LIST OF DOCUMENTS INCLUDED IN APPENDICES.....	vi
EXECUTIVE SUMMARY.....	1
ACKNOWLEDGEMENTS.....	2
1. INTRODUCTION.....	4
1.1 Background and Purpose.....	4
1.2 Statement of Goal.....	5
1.3 Incorporating EPA's Nine Elements.....	6
1.4 Plan Development and Community Participation Process.....	7
2. WATERSHED CHARACTERISTICS.....	9
2.1 Location and Climate.....	9
2.2 Population, Growth Trends and Land Use.....	12
2.2.1 Population and Growth Trends.....	12
2.2.2 Land Cover.....	12
2.2.3 Protected and Public Lands.....	13
2.3 Physical Features.....	14
2.3.1 Waterbodies, Subwatersheds and Streams.....	15
2.3.2 Topography.....	17
2.3.3 Wetlands, Soils and Geology.....	17
2.3.4 Lake Morphology.....	17
2.4 Aquatic Biology.....	18
3. ASSESSMENT OF WATER QUALITY.....	19
3.1 Applicable Water Quality Standards and Criteria.....	19
3.1.1 Designated Uses and Water Quality Classification.....	19

3.1.2 Water Quality Standards and Criteria.....	20
3.1.3 Antidegradation.....	21
3.2 Assimilative Capacity Analysis.....	21
3.2.1 Data Review.....	21
3.2.2 Water Quality Parameters.....	26
3.2.3 Long Term Water Quality Summary.....	30
3.2.4 Assimilative Capacity Analysis.....	31
3.2.5 Establishment of a Water Quality Goal.....	33
3.3 Future Land Use Projections: Buildout Analysis.....	35
3.3.1 Collection of Municipal Zoning Information.....	36
3.3.2 Modeled Growth Rate Scenarios.....	36
3.3.3 Buildout Methodology.....	37
3.3.4 Buildout Results and Use in Water Quality Models.....	38
3.4 Watershed Septic System Survey Assessment.....	39
3.5 Water Quality Model.....	41
3.5.1 Watershed and Subwatershed Delineations.....	41
3.5.2 Basin Divisions.....	42
3.5.3 Land Cover Update.....	43
3.5.4 Other Major LLRM Inputs.....	46
3.5.5 Calibration.....	47
3.5.6 Limitations to the Model.....	49
3.5.7 Results.....	51
3.6 Watershed Stormwater Survey Assessment.....	56
3.6.1 Identification of Potential Stormwater Problem Areas.....	56
3.6.2 On the Ground Surveys.....	56
3.6.3 Data Processing and Prioritizations.....	57

4. MANAGEMENT STRATEGIES.....	57
4.1 Goals for Long-term Protection.....	57
4.2 Addressing Nonpoint Source Pollution (NPS).....	58
4.2.1 Structural NPS Restoration.....	58
4.2.2 Non-Structural NPS Restoration.....	59
5. PLAN IMPLEMENTATION.....	61
5.1 Plan Oversight.....	61
5.2 Adaptive Management Approach.....	62
5.3 Action Plan.....	64
5.3.1 Education and Outreach.....	64
5.3.2 Research.....	66
5.3.3 Further Evaluation.....	68
5.3.4 Monitoring and Assessment.....	69
5.3.5 Land Conservation.....	70
5.3.6 Land Use Regulation, Zoning and Ordinances.....	71
5.3.7 Best Management Practices (BMPs).....	72
5.3.8 Summary of Estimated Load Reduction Based on the Plan.....	72
5.4 Indicators to Measure Progress.....	73
5.5 Target Schedule.....	74
5.6 Estimated Costs and Technical Assistance Needed.....	75
5.7 Water Quality Monitoring Plan.....	78
5.8 Conclusion.....	81
REFERENCES.....	81

LIST OF FIGURES

Figure 1. Temperature and Precipitation for Newport, NH.....	9
Figure 2. Annual Average Temperature at Concord, NH.....	10
Figure 3. Monthly Average Precipitation at Concord, NH.....	11
Figure 4. Ice Out Dates on Lake Sunapee from 1869-2019.....	11
Figure 5. Watershed Area in Each Town in the Lake Sunapee Watershed.....	14
Figure 6. Historic VLAP Monitoring Results for a Deep Station in Lake Sunapee.....	23
Figure 7. Dissolved Oxygen and Temperature Profile, Summer 2016.....	30
Figure 8. Conceptual Diagram for the Determination of Assimilative Capacity for an Oligotrophic Waterbody.....	32
Figure 9. Assimilative Capacity Analysis for Total Phosphorus for Lake Sunapee.....	33
Figure 10. Current Phosphorus Loading to Lake Sunapee.....	34
Figure 11. Loads to Lake Sunapee Under Various Future Management Scenarios.....	35
Figure 12. New London Building Permits.....	36
Figure 13. Age of Septic Systems in Lake Sunapee Watershed.....	39
Figure 14. Average Number of Months a Property is Occupied Per Year.....	40
Figure 15. Average Occupancy of Properties in the Lake Sunapee Watershed.....	40
Figure 16. Septic Tank Pumping Frequency.....	41
Figure 17. Schematic Representation of the Lake Sunapee Watershed.....	42
Figure 18. Subwatershed Land Cover.....	44
Figure 19. Current Land Cover Distribution for Watershed Drainage to Lake Sunapee.....	45
Figure 20. Current Estimated Watershed Load by Aggregated Land Cover Category.....	45
Figure 21. Phosphorus Load (kg/yr) by Subwatershed.....	52
Figure 22. Phosphorus Yield (kg/ha) by Subwatershed.....	53
Figure 23. Predicted in-lake TP concentrations under four scenarios.....	55

LIST OF TABLES

Table 1. <i>Medium Density Residential Areas in the Lake Sunapee Watershed</i>	13
Table 2. <i>Municipality Surface Area Within the Lake Sunapee Watershed</i>	14
Table 3. <i>Waterbody Statistics</i>	15
Table 4. <i>Lake Sunapee Subwatersheds</i>	16
Table 5. <i>Designated Uses for Fresh New Hampshire Surface Waters</i>	19
Table 6. <i>New Hampshire Surface Water Classifications</i>	20
Table 7. <i>Selected New Hampshire Water Quality Standards & Criteria</i>	20
Table 8. <i>Total Phosphorus (TP) and Chl-a for Aquatic Life Designated Use</i>	22
Table 9. <i>Water Sample Results for Waterbodies in Lake Sunapee Watershed</i>	24
Table 10. <i>Pooled Epilimnetic Water Quality Data for 10-year period for Lake Sunapee</i>	31
Table 11. <i>Predicted vs. Measured Water Quality Data Lake Sunapee & Other Waterbodies in the Watershed</i>	48
Table 12. <i>Total Phosphorus and Water Loading Summary by Source</i>	51
Table 13. <i>Predicted Water Quality Parameters Under Different Loading Scenarios</i>	51
Table 14. <i>Existing and Desired Conditions Relevant to Preserving Lake Sunapee Water Quality</i>	62
Table 15. <i>Education & Outreach Plan</i>	64
Table 16. <i>Research</i>	66
Table 17. <i>Further Evaluation</i>	68
Table 18. <i>Monitoring and Assessment</i>	70
Table 19. <i>Land Conservation</i>	70
Table 20. <i>Land Use Regulation, Zoning and Ordinances</i>	71
Table 21. <i>Summary of Estimated Load Reduction Based on Plan</i>	72
Table 22. <i>Environmental Indicators for the Lake Sunapee Watershed Management Plan</i>	73
Table 23. <i>Program Targets</i>	74
Table 24. <i>Estimated Implementation Costs</i>	76
Table 25. <i>VLAP Water Quality Parameters Measured at LSPA Sites</i>	79

LIST OF DOCUMENTS INCLUDED IN APPENDICES

A. Maps.....	85
B. LSPA Historical Timeline.....	100
C. Land Cover Methodology and Classification Schema.....	106
D. Z-test for Lake Sunapee Water Quality Deepwater Stations.....	110
E. Buildout Scenario Tables.....	111
F. Septic System Survey and Methodology.....	115
G. Watershed Survey Datasheet Example.....	120
H. BMP Tables.....	121
I. Road Maintenance and Stormwater BMPs.....	128
J. Town Zoning Ordinances.....	134
K. Shoreline Survey Form Example.....	135
L. Land Prices in the Sunapee Watershed.....	136