PLRM V2.1 RECALCULATED BASELINE POLLUTANT LOADS FOR WASHOE COUNTY AND THE NEVADA DEPARTMENT OF TRANSPORTATION

SEPTEMBER 23, 2016

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CONTENTS

1.0 Background 1

2.0 Recalculated Baseline Pollutant Loads 2

2.1 Catchment Delineation 2

2.2 Catchment Connectivity Assessment 3

2.3 PLRM Model Inputs and Adjustments 4

2.3.1 Meteorological Grid Cell 4

2.3.2 Catchment Slope 5

2.3.3 Land Use 5

2.3.4 Soils 5

2.3.5 Road Condition 5

2.3.6 Road Shoulder 7

2.3.7 Road Connectivity 7

2.3.8 Private Parcel BMP Implementation 8

2.3.9 Parcel DCIA and ICIA 8

2.3.10 Stormwater Treatment BMP Performance 8

2.3.11 Cut Slopes 9

3.0 Results and Discussion 9

3.1 Catchment Load Estimates 9

3.2 Jurisdictional Load Estimates 9

3.3 Lake Tahoe TMDL Milestones 10

Appendix A- Projects Installed 2004 to Present 11

Appendix B- Catchment Boundaries 12

Appendix C- Catchment Connectivity 17

Appendix D- Catchment Properties 22

Appendix E- Baseline Road Conditions 31

Appendix F- FSP Load Rank 36

Appendix G- Baseline Load Results by Catchment 41

Attachement A- Outfall Connectivity Rapid Assessment Methodology 51

References 54

TABLES

Table 1. Urban Implementer Catchment Count 3

Table 2. NDOT Catchment 513 along Highway 50 near Spooner Summit Area-Weighted Average Connectivity 4

Table 3. NDOT Road Condition Score Adjustments for Baseline Load Calculations 6

Table 4. Washoe County Baseline Pollutant Load Comparison 9

Table 5. NDOT Baseline Pollutant Load Comparison 10

Table 6. Washoe County Lake Tahoe TMDL Milestone Load Reductions Based on Baseline Load Results (FSP). 15 Yr Milestone Represents the Clarity Challenge. 65 Yr Milestone Represents the TMDL Numeric Target. 10

Table 7. NDOT Lake Tahoe TMDL Milestone Load Reductions Based on Baseline Load Results (FSP). 15 Yr Milestone Represents the Clarity Challenge. 65 Yr Milestone Represents the TMDL Numeric Target. 10

1.0 BACKGROUND

The Lake Tahoe Total Maximum Daily Load (TMDL) is a science-based plan developed by the Lahontan Regional Water Quality Control Board (LRWQCB) and the Nevada Division of Environmental Protection (NDEP) to understand and restore Lake Tahoe's water clarity. The Lake Tahoe TMDL determined the amount of pollution reduction needed to restore historic clarity and developed an implementation strategy. To meet the 15 year 'Clarity Challenge' by 2026, the Lake Tahoe Urban Implementers must reduce their fine sediment particle loads (FSP <16µm) by approximately 34% from October 2004 baseline pollutant levels.

Rather than NDEP issuing permits to regulate the Lake Tahoe TMDL, Interlocal Agreements (ILAs) were established in 2013 between NDEP and each of the Nevada Urban Implementers: Douglas County, Washoe County, and the Nevada Department of Transportation (NDOT). Each jurisdiction agreed to develop and implement Stormwater Load Reduction Plans (SLRPs) that specified implementation actions and strategies to meet the FSP load reduction milestones and annual credit targets included in the ILAs. As part of the original SLRPs, the jurisdictions also prepared *Baseline and Existing Conditions Final Technical Documents* (NTCD, 2013), which developed baseline pollutant load calculations based on PLRM version 1.1 (v1.1). These calculations were used to establish the five-year pollutant load reduction milestone schedule for the jurisdictions' 2013 ILAs.

In August 2015, the Lake Clarity Crediting Program (LCCP) introduced PLRM version 2.1 (v2.1). Modifications to the PLRM resulted in differences in pollutant loading calculations; these include: (1) a new land use GIS shapefile based on 2010 Lidar data that provided more accurate acreage for the impervious and pervious road land use types. Most changes correspond to heavily forested canopy areas; (2) modifications to pollutant characteristic runoff concentrations (CRCs). These adjustments were intended to more realistically represent baseline conditions of secondary moderate and low risk roads. Because of these revisions, baseline pollutant load calculations needed to be updated.

In September 2016, the three Nevada Urban Implementers will each enter into newly updated, independent ILAs with NDEP. These updated ILAs will include revised pollutant load reduction targets and milestone schedules for each jurisdiction to attain the TMDL clarity goals based on PLRM v2.1 baseline load calculations.

This report provides new PLRM v2.1 baseline pollutant load calculations for NDOT and Washoe County to be used for updated ILAs. Unless addressed herein, all PLRM v1.1 modeling assumptions, inputs and approaches described in the Baseline and Existing Conditions Final Technical Documents prepared by NTCD on December 31, 2013 are implied; please refer to the *Baseline and Existing Conditions Final Technical Documents* (NTCD, 2013) for background information. This report also documents catchment and connectivity adjustments, PLRM v2.1 input changes and differing model assumptions. Updated PLRM v2.1 existing conditions pollutant load calculations are not addressed in this report. However, the Washoe County and NDOT water quality improvement projects (WQIP) and erosion control projects (ECP) installed from 2004 to the present are listed in Appendix A- Projects Installed 2004 to Present.

2.0 RECALCULATED BASELINE POLLUTANT LOADS

2.1 CATCHMENT DELINEATION

Washoe County and NDOT catchments were re-delineated, following the *Lake Clarity Crediting Program Handbook* (LWQCB and NDEP, 2015) guidance, to provide more accurate catchments and reduce human error or bias that could have been introduced while delineating by hand the original catchment GIS shapefile created for use with PLRM v1.1 (PLRM v1.1 catchments). The PLRM v1.1 catchments were hand drawn in ArcGIS based on 20 foot contour intervals, stormwater infrastructure and best professional judgment. To re-delineate the catchments, the more precise and accurate digital elevation model (DEM) data (USGS 2010 Lidar data) and Esri's ArcGIS Spatial Analyst Hydrology tools were applied, creating a few thousand computer generated catchments. Using the PLRM v1.1 catchments as a guideline along with the stormwater infrastructure asset inventory, jurisdictional project boundaries, outfall connectivity and professional judgment, those few thousand catchments were merged in ArcGIS to reform the final catchments for recalculating baseline pollutant loads, referred herein as PLRM v2.1 catchments. The improved catchment accuracy did not have a significant impact on the PLRM results, but the re-delineated catchments provide a better starting point for future project boundaries and computer generated catchments reduced possible human error due to hand-drawing the catchments.

The number of catchments used to recalculate baseline pollutant loads with PLRM v2.1 increased for each jurisdiction due to catchment re-delineation, catchment connectivity or the installation of stormwater treatment BMPs (Table 1).

The number of Washoe County catchments increased from 82 for PLRM v1.1 to 140 for PLRM v2.1. The increase was largely due to breaking the project catchments (Fairway/Fairview Water Quality Improvement Project (WQIP) Phase III, Central Incline Village WQIP Phase I and Phase II and East Incline Village WQIP) into smaller catchments to better define what area is being treated by what new stormwater treatment BMP; 47 of the additional 58 catchments fall in this category. The remaining 11 additional catchments are the result of re-delineating one catchment into two due to catchment connectivity, adding privately owned parcels overlooked while delineating PLRM v1.1 catchments, or including the 0% connected catchments (7) in the overall catchment count that were excluded from the initial baseline load estimate (NTCD, 2013).

The number of NDOT catchments was increased from 95 for PLRM v1.1 to 136 for PLMR v2.1. The increase was largely due to including 22 of the catchments determined to have 0% connectivity in PLRM v1.1 to the overall catchment count. Along with the subdivision of NDOT State Route 28 section of road from the Washoe County line north to Sand Harbor (Atkins catchment) into 10 catchments instead of 1 and adjusting the catchment boundaries to better define connectivity, and the subdivision of NDOT projects (Zephyr Cove WQIP, Pittman Terrace WQIP and the Burke Creek Highway 50 Crossing Project) to define the area being treated by new stormwater treatment best management practices (BMPs) round out the reasoning for the remaining 10 new catchments.

Refinement of catchment delineations allows the jurisdictions to understand the exact area being treated by a stormwater BMP and what areas lack stormwater treatment. For example, if three different stormwater treatment (SWT) BMPs were installed to treat a 100 acre area, PLRM v2.1 can calculate treatment for 3 SWT BMPs within one catchment, but the exact area treated by each SWT BMP will be unknown, making it difficult to recreate that scenario. Thus, the increased overall number of catchments will help the jurisdictions track stormwater treatment BMPs and help recognize areas for further stormwater improvements.

All catchments, regardless of connectivity, were modeled in PLRM v2.1 as a one-time operation to ensure no jurisdictional areas were overlooked. However, if the catchment connectivity was 0% then the catchment did not contribute toward the baseline pollutant load. Catchments originally modeled by other consulting firms were modeled by NTCD for PLRM v2.1 recalculated baseline pollutant loads. Washoe County and NDOT catchment boundary figures can be viewed in Appendix B- Catchment Boundaries and the catchment properties are listed in Appendix D- Catchment Properties.

Table 1. Urban Implementer Catchment Count

JURISDICTION	PLRM v1.1 CATCHMENTS[1]	PLRM v2.1 CATCHMENTS
Washoe County	82	140
NDOT	95	136

[1]Catchment number determined from the Baseline and Existing Conditions Final Technical Documents, Attachment A – Catchment Parameters.

2.2 CATCHMENT CONNECTIVITY ASSESSMENT

Baseline pollutant loads are ultimately based on catchment connectivity; therefore, connectivity for each catchment was reassessed. The *Outfall Connectivity Rapid Assessment Methodology* (OCRAM) (NTCD, 2010 and NTCD, 2012) calculation (Attachment A) and *Lake Clarity Crediting Program Handbook* (LWQCB and NDEP, 2015) guidance provide the basis for determining connectivity. Additionally, aerial photos, best professional judgment and field verification by NTCD or a hired consultant provided updated information to reassess catchment connectivity.

Pollutant loading output from PLRM does not account for catchment connectivity. Therefore, PLRM results were exported to an Excel spreadsheet and a connectivity factor (0% - 100%), as referred to in the *Baseline and Existing Conditions Final Technical Documents* Table 3 (NTCD, 2013), was applied to derive the overall pollutant loadings for each catchment.

The majority of catchments for both Washoe County and NDOT had one outfall to Lake Tahoe or a contributing water body to Lake Tahoe (perennial streams); a few catchments had more than one outfall but had the same connectivity. For the aforementioned catchments, connectivity was assigned a percentage in increments of 20, such as 0%, 20%, 40%, 60%, 80% and 100%. While determining connectivity for the PLRM v1.1 catchments using OCRAM, connectivity percentages were rounded to the nearest OCRAM whole number. For example, if the OCRAM result was 1.4, the number was rounded down to 1.0 which corresponds to 20% connectivity (Attachment A).

Upon reassessing catchment connectivity for PLRM v2.1, a number of NDOT catchments were found to have multiple outfalls with differing connectivity. For PLRM v1.1 baseline load calculations, an average connectivity was assigned to such catchment. For this study, an area-weighted connectivity was assigned to catchments with multiple outfalls of differing connectivity. For example, NDOT catchment #513 has 3 outfalls with 60%, 60% and 40% connectivity. In PLRM v1.1 the catchment was assigned a 60% connectivity based on a visual assessment of the catchment area discharging to each outfall. In PLRM v2.1, area-weighting of the drainage area of the 3 outfalls yields a connectivity of 46% (Table 2). The resulting connectivity was rounded to nearest 5% increment, thus catchment #513's final connectivity was 45%. The area-weighted approach provides a refined connectivity estimate and enables the catchment to remain as one instead of being broken into three of smaller size.

Table 2. NDOT Catchment 513 along Highway 50 near Spooner Summit Area-Weighted Average Connectivity

513 OUTFALLS	OUTFALL CONNECTIVITY	PLRM v1.1 AREA (acres)	PLRM v1.1 CONNECTIVITY	PLRM v2.1 AREA (acres)	PLRM v2.1 WEIGHTED CONNECTIVITY
A	60%	8.08	60%	2.86	46%
B	40%			5.61	
C	40%			1.53	

Washoe County and NDOT catchment connectivity figures can be viewed in Appendix C- Catchment Connectivity and the connectivity per catchment tables are listed in Appendix D- Catchment Properties.

2.3 PLRM MODEL INPUTS AND ADJUSTMENTS

The basis for PLRM v2.1 input parameters were GIS shapefiles provided with the download of PLRM v2.1 (https://www.enviroaccounting.com/TahoeTMDL/Program/Display/ForUrbanJurisdictions):

- Landuse_Imp2011_LU2014.shp
- Soils_Baseline.shp
- BaselineRoadCondition.shp
- RoadShoulders_2011.shp
- RoadConnectivity_2011.shp

The GIS tool embedded within PLRM v2.1 extracted data from these GIS files and automatically populated the PLRM v2.1 Projects based on a corresponding catchment(s) GIS shapefile. Unfortunately, a few select PLRM hand adjustments were still needed:

- adjusting the parcel directly connected impervious area/indirectly connected impervious area (DCIA/ICIA) from the default 50% values for Washoe County
- adjusting the road shoulder average annual infiltration rate for NDOT catchments
- occasional catchment slope adjustments

Despite the GIS shapefiles listed above encompassing the entire Lake Tahoe Basin, only data for the Nevada side of the Lake was needed. Thus, the GIS shapefiles were clipped to smaller areas that represent sections of Washoe County and NDOT; the smaller areas are identified by the sub-headings in the Appendix D- Catchment Properties tables (SR207, Discharging to Burnt Cedar Creek, etc). Working with smaller areas of data allows the GIS user to remain focused on the area of interest, make adjustments to only the area of interest and the GIS extraction tool runs faster.

2.3.1 METEOROLOGICAL GRID CELL

Each PLRM Project has a specific meteorological grid (Met Grid) cell. When multiple catchments within a PLRM Project span multiple meteorological grid cells, the different Met Grid Average Annual Precipitation values were averaged. The Met Grid with the closest average annual precipitation value to the overall average precipitation value of the multiple Met Grids was applied. For the LCCP Credit Accounting Platform (CAP) registration process, each uploaded PLRM Project must have the same connectivity and Met Grid; to avoid uploading many PLRM

Projects, multiple catchments with the same connectivity are grouped into one PLRM Project and assigned one best representative Met Grid.

2.3.2 CATCHMENT SLOPE

PLRM v1.1 catchment slope percentages were calculated using a contour GIS shapefile. The slope percent equation per catchment being the highest elevation minus the lowest elevation divided by the distance between the two points, which represents the average slope of the catchment, resulting in a precise number (13%, 2% or 27%), yet PLRM results are not sensitive to slope adjustments. For PLRM v2.1, a simplified slope percentage was applied to each catchment based on the slope applied for PLRM 1.1. The PLRM v2.1 simplified slope percentages ranged from 1% to increments of 5 (5%, 10%, 15%) up to a maximum slope of 30%. For example if a catchment had a slope of 3% for PLRM v1.1, the slope was adjusted to 5% for PLRM v2.1.

2.3.3 LAND USE

The land use GIS shapefile (Landuse_Imp2011_LU2014.shp) was originally generated based on 2010 conditions, therefore not always representative of 2004 baseline conditions. Minor adjustments to the land use GIS shapefile provide more accurate and representative baseline pollutant loads that existed in 2004. The minor adjustments include but are not limited to the following:

- Relabeling private driveways as single family residential impervious (SFR_Impervious) instead of Roads_Impervious
- Removing all land use designations from NDOT catchments except *Roads_Impervious*, *Roads_Pervious* and *Erosion Potential 1* through *5*
- Returning a parcel to pre-2004 land use designation: relabeling a parcel Erosion Potential from multi-family residential (MFR) or relabeling a parcel commercial-institutional-communications-utilities (CICU) from Erosion Potential
- The majority of land use changes were associated with catchments slated for the Credit Accounting Platform (CAP) registration, but minor adjustments occurred to non-registered catchments if best professional judgment of an incorrectly labeled property was known.

2.3.4 SOILS

No adjustments to the soils GIS shapefile (Soils_Baseline.shp) were applied.

2.3.5 ROAD CONDITION

The road condition GIS shapefile for PLRM v1.1 was originally generated in 2010 and provided road condition information as a primary or secondary road with designations of high, moderate, and low risk based on the amount of road traffic, elevation and general aspect. The Lake Clarity Crediting Program tools revision to PLRM v2.1 developed a road condition GIS shapefile (BaselineRoadCondition.shp) that provides a road condition score for each road segment. The corresponding road designation and road condition score for PLRM v2.1 are as follows:

- Primary high risk (PHR) = 1.4
- Primary moderate risk (PMR) = 1.7
- Primary low risk/secondary high risk(PLR/SHR) = 2.0

- Secondary moderate risk (SMR) = 2.3
- Secondary low risk (SLR) = 2.6

Both Washoe County and NDOT adjusted road condition scores for segments of road for the recalculated baseline load results. Washoe County adjusted the default road condition score from a 2.6 to a 2.0 at the following locations:

- Country Club Drive from 2nd Tee Drive/Country Club Drive intersection to the Mt. Rose State Route 431/Country Club Drive intersection
- Village Blvd from College Drive/Village Blvd intersection to Village Blvd/Country Club Drive intersection.

PLRM v1.1 had originally identified these sections of Country Club Drive and Village Boulevard as primary roads; however, that definition appears to have been mistakenly lost with the release of PLRM v2.1. Instead the roads are identified as secondary low risk roads with baseline conditions scores of 2.6. Both are major roads within Incline Village that are used as short cuts between State Route 28 (SR28) and State Route 431 (SR431) to avoid travel through downtown. As identified in PLRM v1.1, the nature and speeds of the vehicular traffic that the road experiences dictate that the roads function as primary roads; therefore, for this registration, Washoe County has conservatively identified these roads as primary low risk with a baseline condition score of 2.0. Washoe County may revisit this assessment for future registrations.

The default road condition score adjustments NDOT applied are shown in Table 3. The Washoe County and NDOT adjusted baseline road condition score figures are displayed in Appendix E- Baseline Road Condition.

Table 3. NDOT Road Condition Score Adjustments for Baseline Load Calculations

COUNTY	ROAD CREW	ROAD SECTION	DEFAULT ROAD CONDITION SCORE(S)	ADJUSTED ROAD CONDITION SCORE
Washoe	A	SR431 Mile Post 0-3	1.4, 1.7	1.4
Washoe	B	SR28-Crystal Bay to Mt Rose	1.4	1.4
Washoe	B	SR28-Mt Rose to Lakeshore Blvd	1.4, 1.7, 2.0	1.4
Washoe, Carson City, Douglas	B	SR28-Lakeshore Blvd to HWY50	1.4, 1.7, 2.0	1.7
Douglas	B	HWY50-SR28 to Stateline	1.4	1.4
Douglas	C	SR207-Kingsbury Grade	1.4	1.4
Douglas	B	SR760-Elks Point Road	2.0	2.0

NDOT has 3 separate road crews (A, B, and C) performing road operations and maintenance on their Tahoe Basin roads, each crew has different equipment, different crew leaders and different weather patterns. The adjusted road condition score represent baseline road conditions from 2004 prior to increased sweeper frequency, improved sweepers, abrasive application improvements, new abrasives that resist degradation and improved weather forecasting.

The road condition score adjustment for SR431 Mile Post 0-3 was applied based on the Road RAM data collected during water year 2016 (WY16) which averaged road condition scores of 1.4 and 1.6 in January and February 2016 respectively. The March, May and June scores were 2.1, 2.0 and 2.9 respectively. Based on the low WY16 Road

RAM scores and the subsequent sweeping frequency, type of sweeper, type of abrasive and abrasive application improvements since 2004, an adjusted baseline road condition score of 1.4 was applied.

The road condition score for SR28-Mt Rose to Lakeshore Blvd was also adjusted to a 1.4. While the sweeping and abrasive improvements mentioned above apply to this road section as well, the majority of SR28-Mt Rose to Lakeshore Blvd was labeled as a 1.4, thus to prevent the road condition score from changing every few hundred feet, a 1.4 road condition score was applied.

The SR28-Lakeshore Blvd to HWY50 road condition score was adjusted to a 1.7. The WY16 Road RAM scores for the lowest sloped areas in this road section were 2.0 for both January and February, which represents all NDOT road operations and maintenance improvements since 2004, thus a 1.7 road condition score for this road section is justified for baseline conditions.

2.3.6 ROAD SHOULDER

The road shoulder GIS shapefile (RoadShoulders_2011.shp) was originally generated based on 2010 conditions, thereby not necessarily representative of 2004 baseline conditions. Road shoulder adjustments were necessary considering both NDOT and Washoe County implemented water quality improvement and erosion control projects in the years spanning 2004 to 2010. Projects plans, installed between 2004 and 2010 (Appendix A), were reviewed for curb and gutter or permeable paver installation on roads since the baseline date, these road shoulder conditions were changed to 'erodible', based on the assumption that curb and gutter was installed due to eroding road shoulders.

Additional project plans, maps and GIS data provided by other consultants for projects installed between 2010 and 2016 were reviewed for road shoulder adjustments for both NDOT and Washoe County. As part of the project planning, consultants often created more detailed maps of road shoulder conditions than the road shoulder GIS shapefile. If more detailed road shoulder information was available and field verification along with project research could show the consultant's maps were correct, following the methodology outlined in the *Lake Clarity Crediting Program Handbook* (LWQCB and NDEP, 2015), the road shoulder GIS shapefile was adjusted to better represent actual baseline conditions.

The road shoulder infiltration rates for Washoe County were not adjusted. All road shoulder infiltration rates for NDOT were adjusted to 0.1 inches per hour (in/hr), for PLRM v1.1 and PLRM v2.1, from default values ranging 0.13 in/hr - 0.43 in/hr to better simulate the effects of soil compaction to infiltration on the compacted pervious portions of the roadway.

2.3.7 ROAD CONNECTIVITY

The road connectivity GIS shapefile (RoadConnectivity_2011.shp) was originally generated based on 2010 conditions, thereby not always representative of 2004 baseline conditions. Road connectivity adjustments were necessary considering both NDOT and Washoe County implemented water quality improvement and erosion control projects in the years spanning 2004 to 2010.

Based on the research done for road shoulder adjustments, the road connectivity designations were adjusted to spatially match the road shoulder adjustments and better represent actual baseline conditions. Road connectivity designations are either DCIA or ICIA. For example, a road shoulder labeled as stable and protected in 2010, indicating curb and gutter would have a road connectivity of DCIA. However, if project plans show the road

shoulder was improved to curb and gutter from erodible in 2006, the baseline road shoulder should be adjusted to erodible and the road connectivity quite possibly should be adjusted to ICIA, depending on road side conditions.

2.3.8 PRIVATE PARCEL BMP IMPLEMENTATION

The standard values for BMP implementation inputs were not adjusted for baseline load calculations from the PLRM v1.1 values listed on Table CC2.8 of the *Lake Clarity Crediting Program Handbook* (LWQCB and NDEP, 2011 page TT-38). Private parcels for SFR/MFR/CICU receive 7%/19%/5% compliance for baseline load calculations respectively based on TRPA BMP certified parcel data for 2004. Private parcel BMP implementation applies to Washoe County catchments only. NDOT roads are not considered parcels and thus do not have private parcel BMP implementation.

2.3.9 PARCEL DCIA AND ICIA

Parcel DCIA percentages of 30%, 50% and 70% for SFR, MFR and CICU respectively were recommended by Northwest Hydraulics Consultants (PLRM v2.1 Training 1, July 2016) based on the average percent imperviousness for each land use across the entire Lake Tahoe Basin. The recommended percentages for all catchments were adjusted based on best professional judgment of the catchment slope, aspect and DCIA to the stormwater infrastructure. Parcel DCIA percentages per catchment from PLRM v1.1 were applied to each respective catchment for PLRM v2.1. Parcel DCIA percentages apply to Washoe County catchments only; NDOT roads are not considered parcels and thus do not have parcel DCIA/ICIA.

2.3.10 STORMWATER TREATMENT BMP PERFORMANCE

Based on PLRM v1.1 precedent, treatment vaults in PLRM v2.1 were modeled at 1 cubic foot per second (cfs), regardless of the manufacturer treatment flow rate, due to circumstantial evidence and best professional judgment that vaults do little to remove pollutants. A treatment vault's Characteristic Effluent Concentrations (CECs) were also adjusted to reflect a treatment vaults inability to remove pollutants; the following values were chosen to reflect a less than 5% pollutant removal rate for total suspended solids (TSS), FSP, TN and TP (Brent Wolfe, personal comm. July 2016). Treatment vault adjusted CEC values:

- 250 mg/l TSS
- 250 mg/l FSP
- 2.5 mg/l TN
- 1.0 mg/l TP
- 0.28 mg/l DIN
- 0.1 mg/l SRP

To reflect a decreased rate of function for stormwater treatment basins installed prior to 2004, basin infiltration rates were decreased from their default values in PLRM v1.1 and v2.1. A 0.1 inches per hour (in/hr) infiltration rate was applied for all infiltration basins and 0.05 in/hr for all dry basins compared to respective default values of 0.4 in/hr and 0.2 in/hr.

Washoe County and NDOT do not intend to co-register catchments at this time, yet multiple stormwater treatment BMPs treat co-mingled stormwater runoff. For simplicity of registration, the stormwater treatment BMP was removed as treatment from the jurisdiction not responsible for the BMP installation and maintenance.

2.3.11 CUT SLOPES

Cut slopes contribute a relatively minor amount to the overall pollutant loading. PLRM does not have the ability to model road cut slope erosion. Therefore, the recalculated baseline pollutant loads do not address pollutant loading due to road cut slopes. Refer to the *Baseline and Existing Conditions Final Technical Documents* (NTCD, 2013) for an estimated pollutant load for NDOT cut slopes.

3.0 RESULTS AND DISCUSSION

The following sections present the baseline pollutant load estimates for the jurisdictions per catchment, the overall baseline pollutant load estimate and the estimated load reductions necessary to meet the Lake Tahoe TMDL objectives.

3.1 CATCHMENT LOAD ESTIMATES

PLRM estimates of pollutant loads are output in pounds per year (lbs/yr) of fine sediment particles (FSP), total nitrogen (TN) and total phosphorus (TP) per catchment. Washoe County and NDOT catchment baseline loads were then adjusted for connectivity.

For comparative purposes, each catchment's FSP load was divided by its urban area[1] for an FSP loading per unit of area (lb/yr/acre). Identifying catchments that contribute relatively high FSP loads per unit area within each jurisdiction provides the jurisdictions with a strategy for implementing future projects or road operations to reduce stormwater pollutants and meet the Lake Tahoe TMDL objectives. The results are shown graphically for each jurisdiction in Appendix F- FSP Load Rank. These loads are normalized to area then ranked as percentiles, corresponding to the baseline load results listed in Appendix G- Baseline Load Results by Catchment.

3.2 JURISDICTIONAL LOAD ESTIMATES

The catchment baseline pollutant loads for both NDOT and Washoe County, as adjusted for the relative connectivity of each catchment, were summed to show each jurisdiction's PLRM v1.1 and PLRM v2.1 baseline pollutant loads (Table 4 and 5). In addition to changes to catchment delineations and connectivity, PLRM v2.1 modifications and a more accurate land use GIS shapefile account for the baseline pollutant load adjustments.

Table 4. Washoe County Baseline Pollutant Load Comparison

WASHOE COUNTY	CATCHMENTS (number)	URBAN AREA (acres)	ROAD IMPERVIOUS (acres)	SURFACE RUNOFF (ac-ft/year)	FSP (lbs/year)	TP (lbs/year)	TN (lbs/year)
PLRM v1.1	82	4,191	345	683	208,300	1,000	4,240
PLRM v2.1	140	3,922	316	732	290,412	1,228	4,722
% Difference	71%	-6%	-8%	7%	39%	23%	11%

[1] Urban area is different for Washoe County and NDOT. Washoe County urban area refers to the entire area for all catchments, including all land uses. NDOT urban area refers to the road acreage only.

Table 5. NDOT Baseline Pollutant Load Comparison

NDOT	CATCHMENTS (number)	URBAN AREA (acres)	ROAD IMPERVIOUS (acres)	SURFACE RUNOFF (ac-ft/year)	FSP (lbs/year)	TP (lbs/year)	TN (lbs/year)
PLRM v1.1	95	391	156	178	158,900	440	1,470
PLRM v2.1	136	260	211	249	205,006	564	1,704
% Difference	43%	-34%	35%	40%	29%	28%	16%

3.3 LAKE TAHOE TMDL MILESTONES

The Lake Tahoe TMDL establishes load reduction milestones as percent reductions from the baseline loads. Tables 6 & 7 present FSP load reduction milestones, calculated from each jurisdictions baseline pollutant loading. Only FSP load reductions are presented, since this is the primary pollutant controlling clarity and the focus of the Clarity Challenge. A comparison of PLRM v1.1 and v2.1 FSP load reductions and corresponding Lake Clarity credits for each jurisdiction are presented for the first 5 yr milestone. Subsequent milestones are presented based on the recalculated PLRM v2.1 jurisdictional baseline FSP loads.

Table 6. Washoe County Lake Tahoe TMDL Milestone Load Reductions Based on Baseline Load Results (FSP). 15 Yr Milestone Represents the Clarity Challenge. 65 Yr Milestone Represents the TMDL Numeric Target.

WASHOE COUNTY	BASELINE FSP LOAD	5 yr (10%) MILESTONE	10 yr (21%) MILESTONE	15 yr (34%) MILESTONE	65 yr (71%) MILESTONE
PLRM v1.1 Pounds FSP	208,300	20,800			
PLRM v1.1 Credits	1,042	104			
PLRM v2.1 Pounds FSP	290,412	29,041	60, 987	98,740	206,193
PLRM v2.1 Credits	1,452	145	305	494	1031

1 credit = 200 lbs/yr FSP

Table 7. NDOT Lake Tahoe TMDL Milestone Load Reductions Based on Baseline Load Results (FSP). 15 Yr Milestone Represents the Clarity Challenge. 65 Yr Milestone Represents the TMDL Numeric Target.

NDOT	BASELINE FSP LOAD	5 yr (10%) MILESTONE	10 yr (21%) MILESTONE	15 yr (34%) MILESTONE	65 yr (71%) MILESTONE
PLRM V1.1 POUNDS FSP	158,900	15,900			
PLRM V1.1 CREDITS	793	79			
PLRM V2.1 POUNDS FSP	205,0006	20,501	43,051	69,702	145,554
PLRM V2.1 CREDITS	1,025	103	215	349	728

1 credit = 200 lbs/yr FSP

APPENDIX A- PROJECTS INSTALLED 2004 TO PRESENT

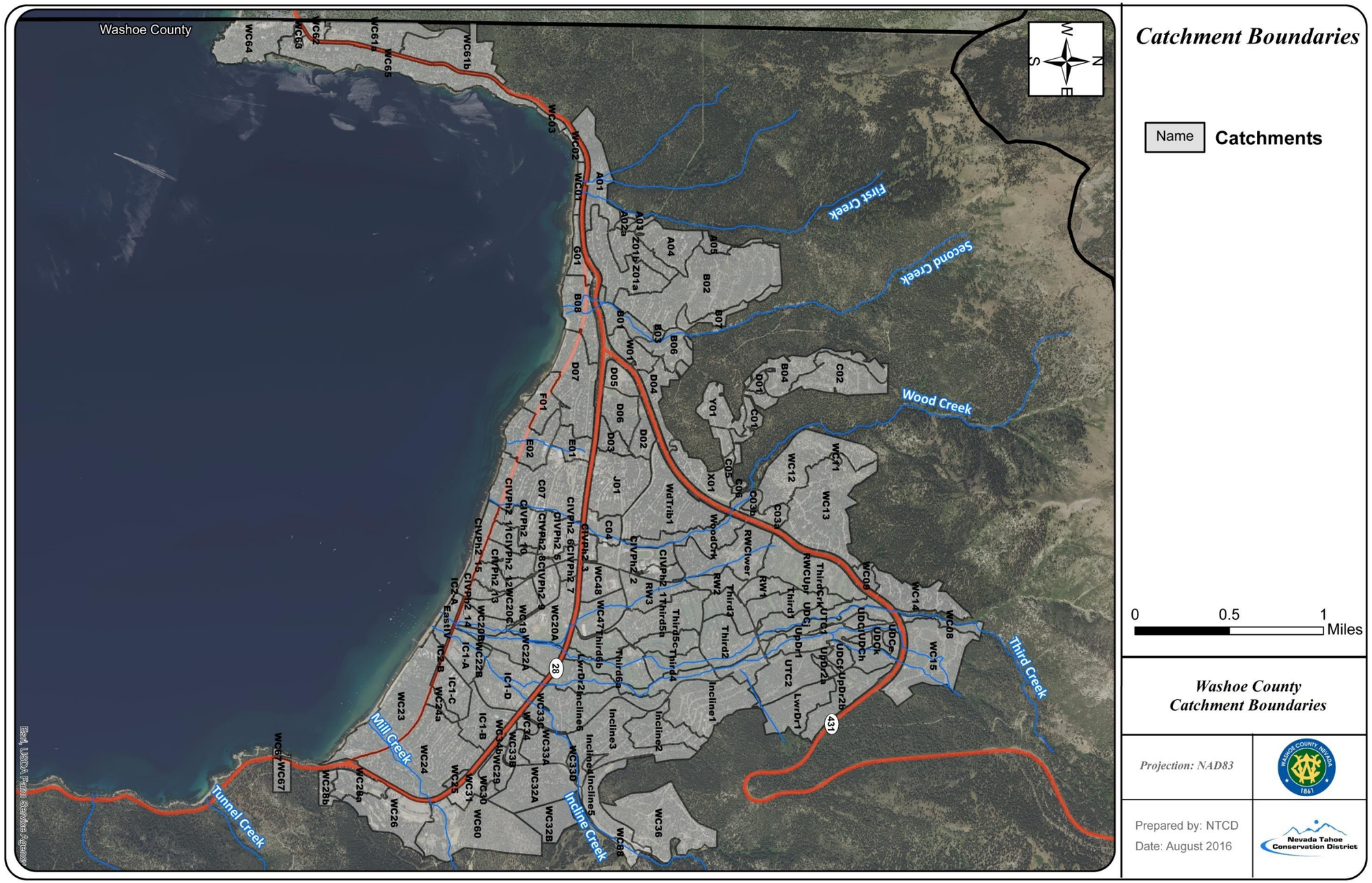
Washoe County WQIP or ECP Installed from 2004 to Present

PROJECT NAME	CATCHMENT ID	YEAR COMPLETED	KEY WATER QUALITY IMPROVEMENTS REPRESENTED IN PLRM
Incline Village Unit 4, Ponderosa WQIP	A01, A04, B02, B06, B07, D04, W01, Z01	2004	Infiltration feature, dry basins, treatment vault, shoulder stabilization
Incline Village Tourist/Fairway WQIP Phase II,	IC1-B, IC1-C, IC1-D, Thirc5c	2006	Infiltration basin, infiltration features, treatment vaults, shoulder stabilization
Incline Village Fairway Phase III- Country Club WQIP	Third2, Incline1	2007	Dry basin, infiltration feature
Crystal Bay Phase I	WC64	2008	Shoulder stabilization, infiltration feature
Crystal Bay Phase IB & IIA	WC61	2009	Shoulder stabilization
Hybrid Project	RW2	2011	Infiltration basins, infiltration features
Incline Village Fairview/Fairway WQIP Phase III	RW1, RW2, UDCf, UDCh, UDCj, UDCl, LwrDr1, UpDr2b	2013	Cartridge filters, infiltration basins, shoulder stabilization
Central Incline Village WQIP Phase I	RWCUper, RWCLwer, WdTrib1, WoodCrk	2014	Infiltration features, shoulder stabilization
Central Incline Village WQIP Phase II	CIVph2_1 to CIVph2_15	2015	Infiltration basins, infiltration features, shoulder stabilization

NDOT WQIP or ECP Installed from 2004 to Present

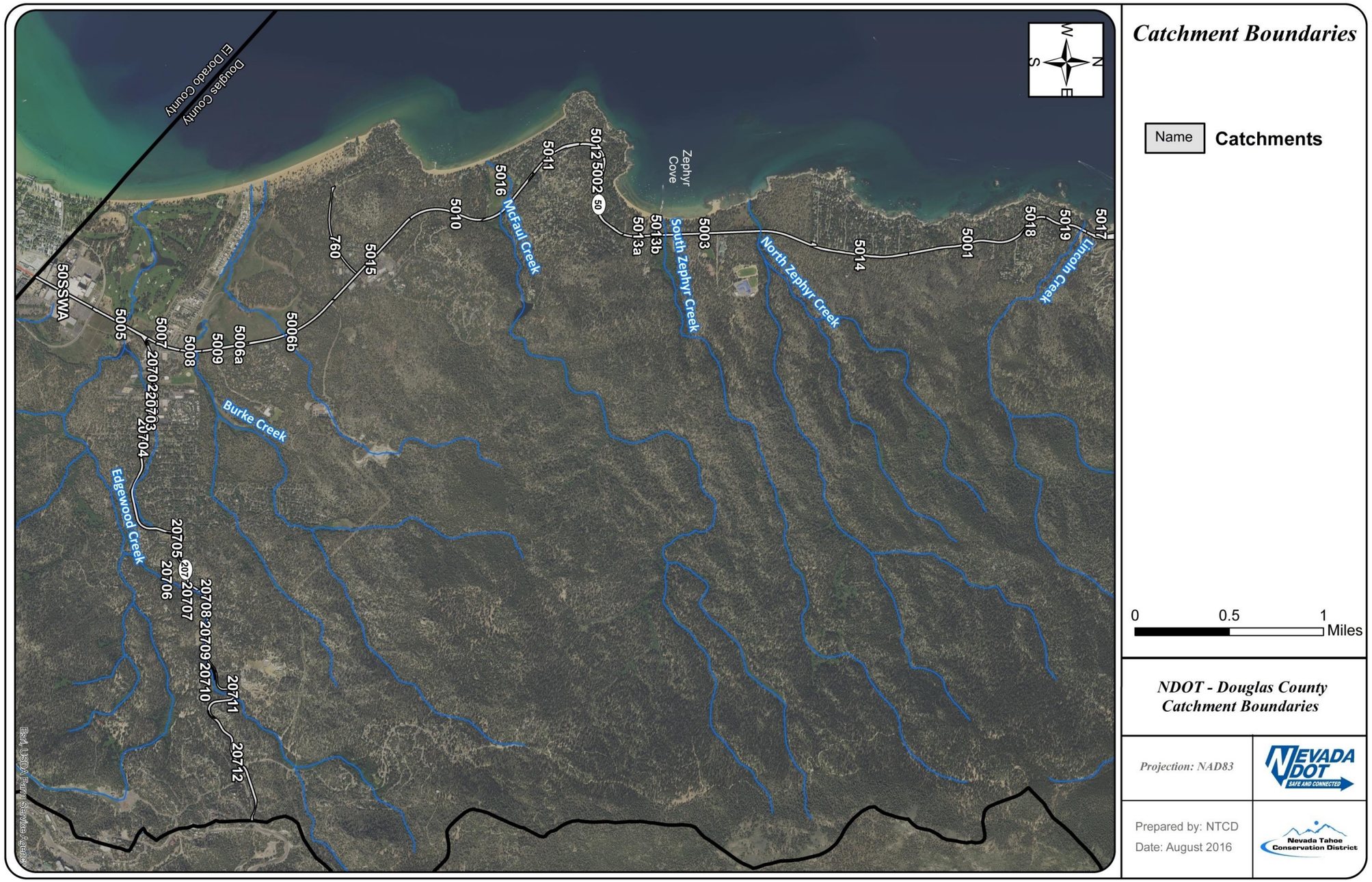
PROJECT NAME	CATCHMENT ID	YEAR COMPLETED	KEY WATER QUALITY IMPROVEMENTS REPRESENTED IN PLRM
US50- Bourne Meadow to Zephyr Cove	5002, 5011, 5012, 5016	2004	Shoulder stabilization
US50- Kahle Drive to Elks Point Road	5006, 5008, 5009	2005	Shoulder stabilization
US50 Zephyr Cove (49, Bourne Meadow to 83, Warrior Way	5002	2005	Shoulder stabilization
SR28 Tahoe Blvd- Lakeshore to Mt Rose	2813	2005	Treatment vault
US50- Cave Rock to Glenbrook	502-506	2006	Dry basin, infiltration basins, shoulder stabilization
Lakeridge General Improvement District	5018	2006	Dry basins
SR207 Kingsbury- US 50 to Dagget Pass	20703-20712	2011	Shoulder stabilization, infiltration basin
SR28- Mt Rose to Crystal Bay	2821, 2853-2859, 2810,	2012	Dry basin, cartridge filter, shoulder stabilization
SR431 Drainage Improvement Plans	431002-431006, 431008-431011, 431018, 431020, 431050	2012	Shoulder stabilization, cartridge filters, infiltration basin, dry basin
SR431 & SR28 Roundabout Drainage Plans	431001, 2861	2013	Dry Basin, shoulder stabilization
SR28- Incline Village Green Streets	2821, 2861, 2863Gn, 2816, 2850BGn	2014	Infiltration basins

APPENDIX B- CATCHMENT BOUNDARIES


Washoe County
Tunnel Creek
Mill Creek
Incline Creek
Third Creek
First Creek
Second Creek
Wood Creek
Esri, USDA Farm Service Agency
Catchment Boundaries
Name
Catchments
0
0.5
1
Miles
Washoe County
Catchment Boundaries
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District


Placer County
Washoe County
2860
2859
2858
2853
2854
2857
2855
2810
2856
2821
2861
431001
431002
431003
431004
2862
2863
2864
2804
2814
2815
2816
431005
431006b
431007a
431007b
431008
431020
431009
431019
431050
431018
431013
431010a
431011
431010c
First Creek
Second Creek
Wood Creek
Rosewood Creek
Third Creek
Deer Creek
Incline Creek
Mill Creek
Tunnel Creek
2818
2808
2805
2809
2850Bgn
2850A
2850B
2851
2813
2820
2952
2823
2824
2825
2826
2846
2827
Atk10
Atk9
Bs4, USDA Farm Service Agency
N
S
W
E
Catchment Boundaries
Name
Catchments
0
0.5
1
Miles
NDOT - Washoe County
Catchment Boundaries
Projection: NAD83
NEVADA DOT
SAFE AND CONNECTED
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District


Washoe County
Carson City
Secret Harbor
Sand Harbor
Marlette Creek
Bliss Creek
Lincoln Creek
Glenbrook
Glenbrook Creek
Slaughterhouse Creek
Douglas County
Carson City
Logan House Creek
Esri, USDA Farm Service Agency
Catchment Boundaries
Name
Catchments
0
0.5
1
Miles
NDOT - SR28 East Shore
Catchment Boundaries
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District



Catchment Boundaries

Name **Catchments**

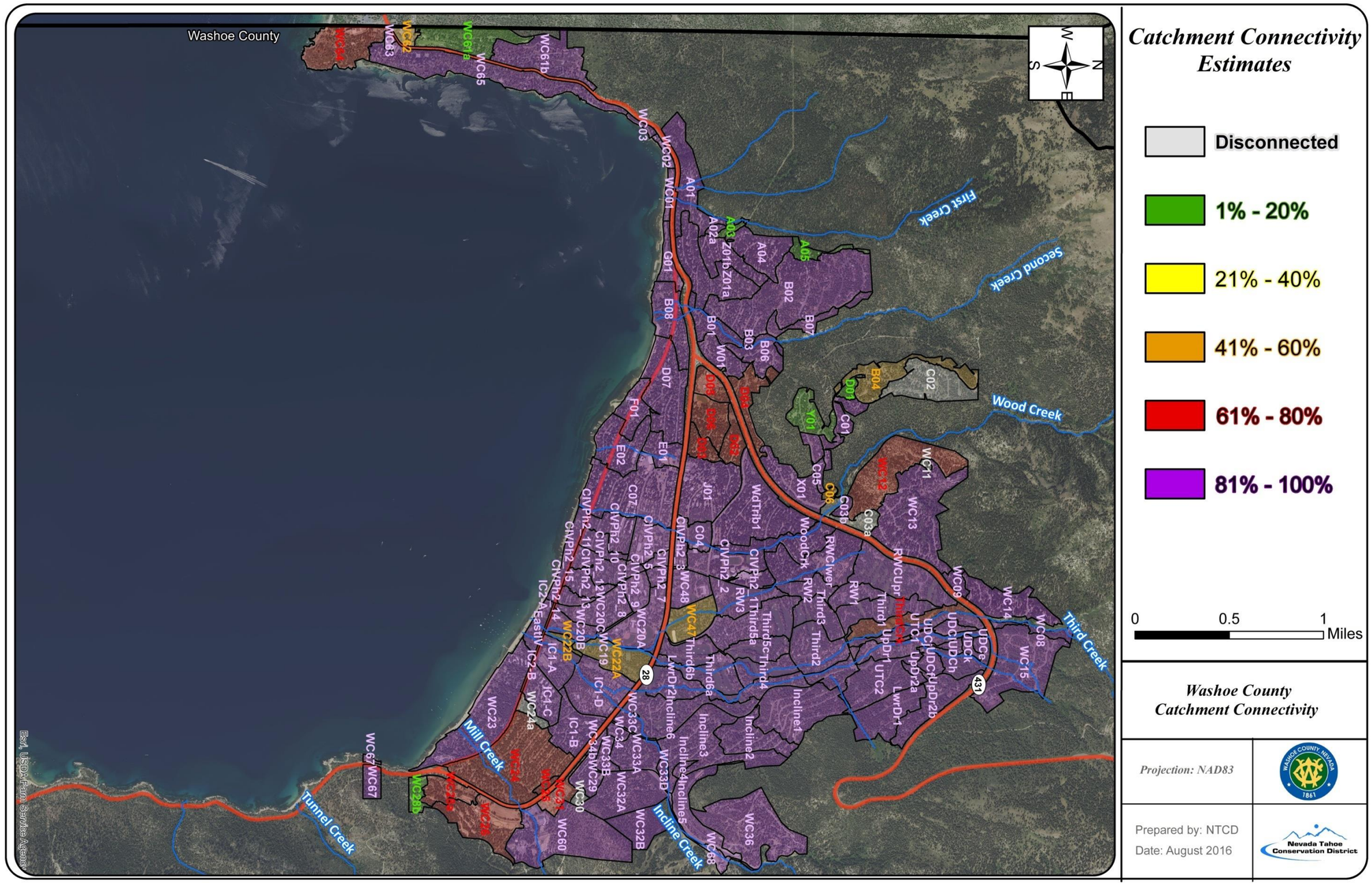
0 0.5 1 Miles

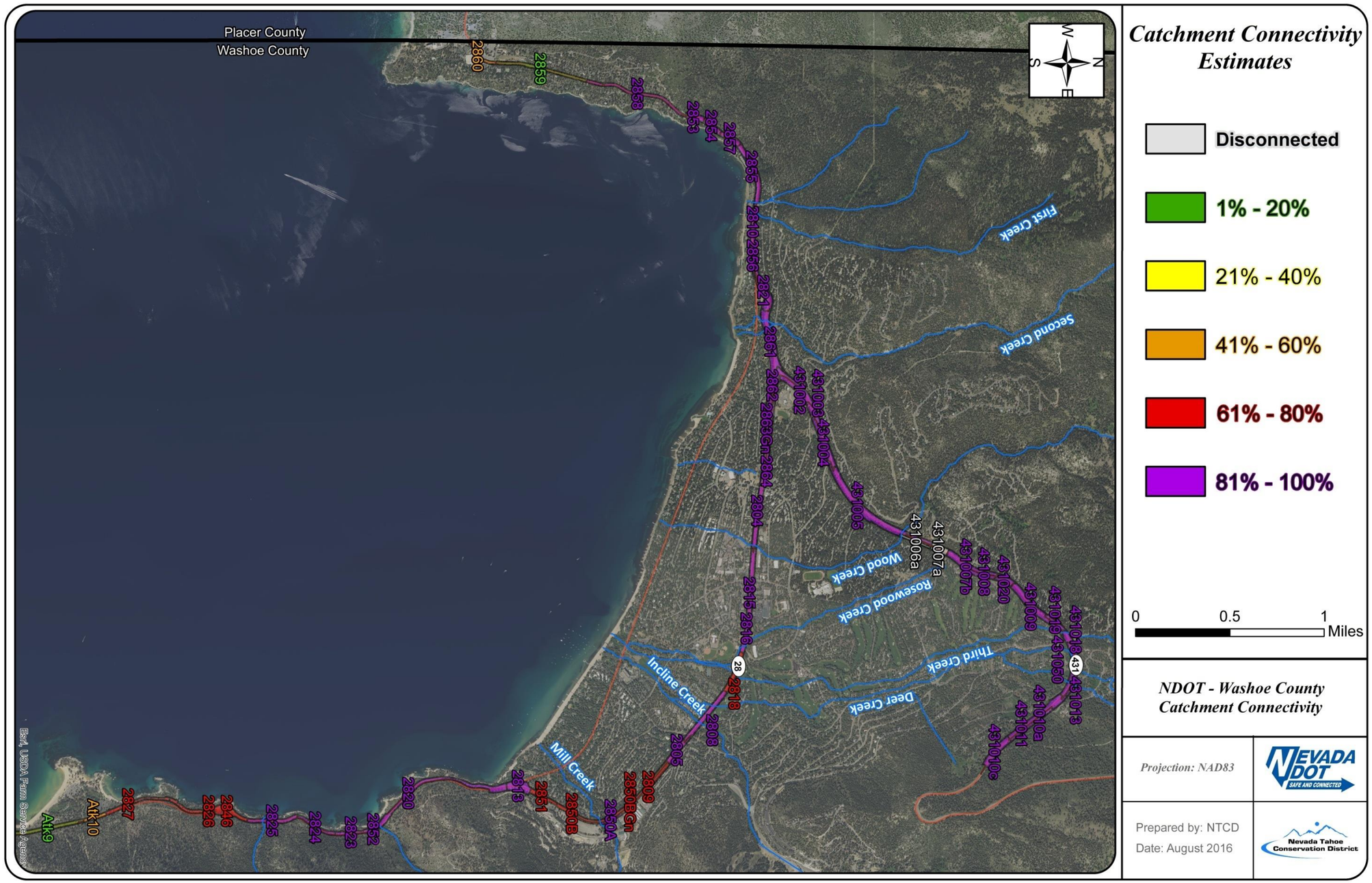
NDOT - Douglas County Catchment Boundaries

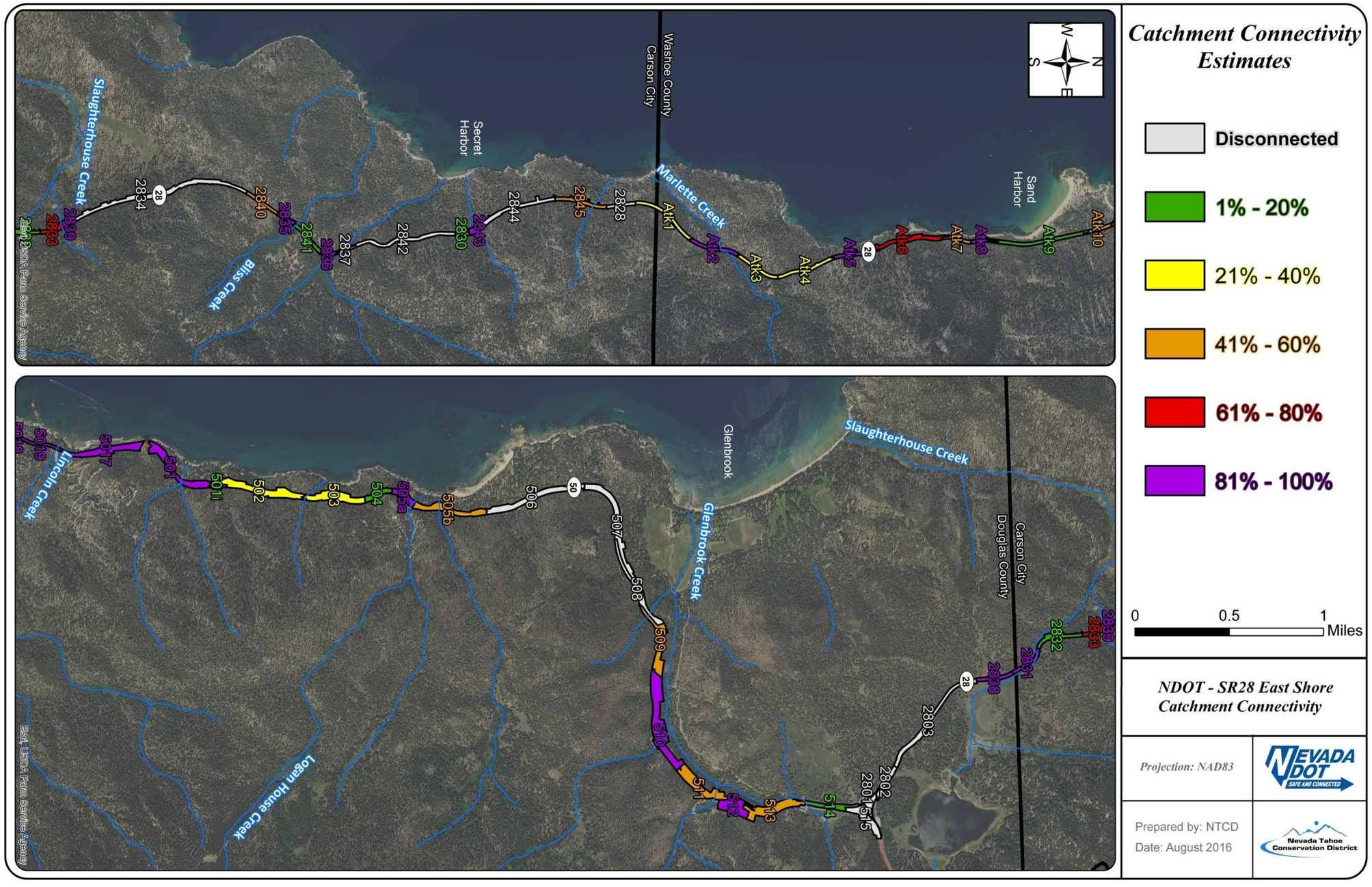
Projection: NAD83

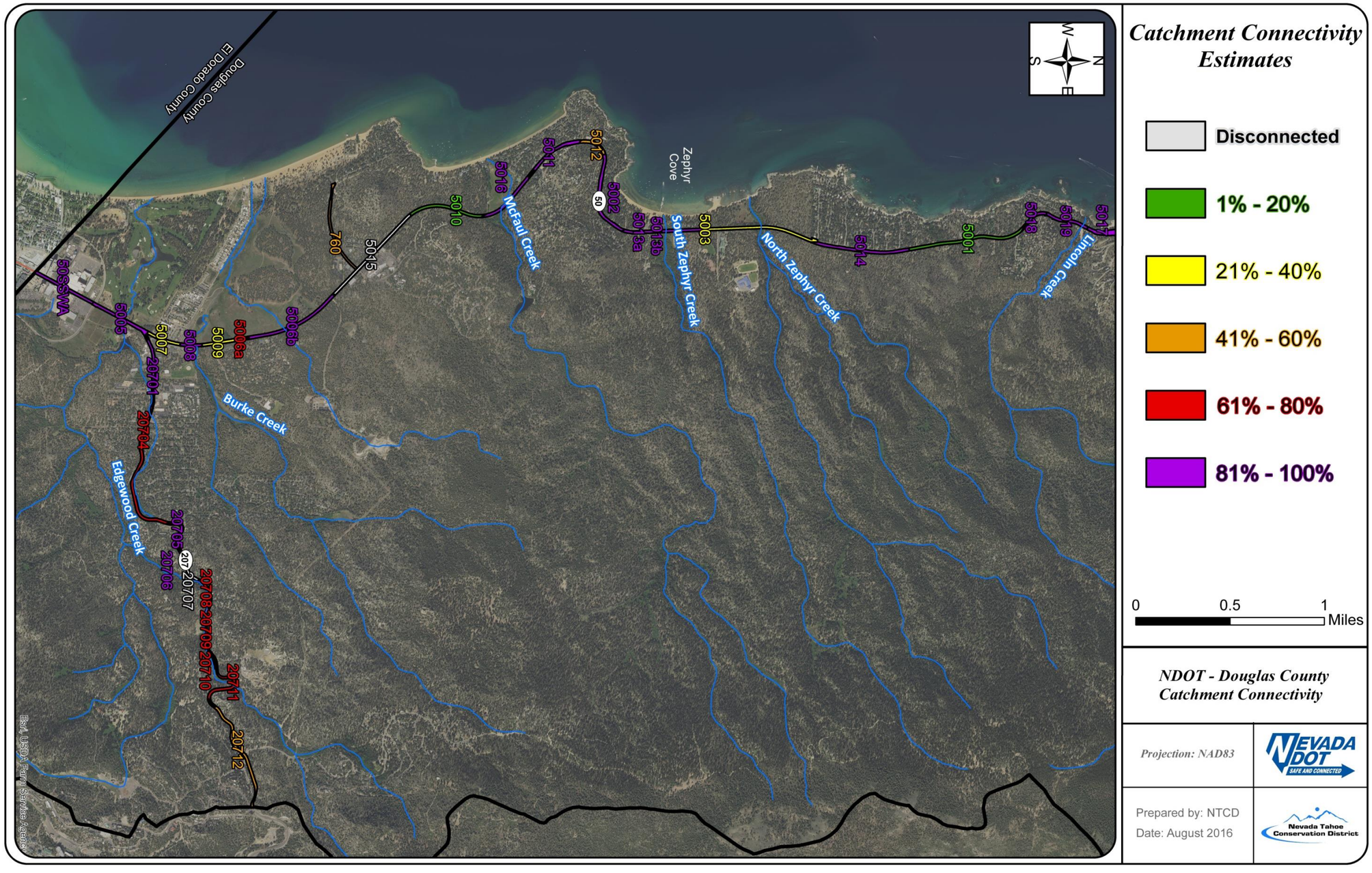
Prepared by: NTCD
Date: August 2016

APPENDIX C- CATCHMENT CONNECTIVITY


Washoe County
Catchment Connectivity Estimates
Disconnected
1% - 20%
21% - 40%
41% - 60%
61% - 80%
81% - 100%
0
0.5
1
Miles
Washoe County
Catchment Connectivity
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District
First Creek
Second Creek
Wood Creek
Third Creek
Mill Creek
Tunnel Creek
Incline Creek
28
431
Esri, USDA Farm Service Agency


Placer County
Washoe County
First Creek
Second Creek
Wood Creek
Rosewood Creek
Third Creek
Deer Creek
Incline Creek
Mill Creek
Esri, USDA Farm Service Agency
Catchment Connectivity Estimates
Disconnected
1% - 20%
21% - 40%
41% - 60%
61% - 80%
81% - 100%
0
0.5
1
Miles
NDOT - Washoe County
Catchment Connectivity
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District


Slaughterhouse Creek
Bliss Creek
Secret Harbor
Washoe County
Carson City
Marlette Creek
Sand Harbor
Lincoln Creek
Glenbrook
Glenbrook Creek
Slaughterhouse Creek
Douglas County
Carson City
Logan House Creek
Esri, USDA Farm Service Agency
Catchment Connectivity Estimates
Disconnected
1% - 20%
21% - 40%
41% - 60%
61% - 80%
81% - 100%
0
0.5
1
Miles
NDOT - SR28 East Shore Catchment Connectivity
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District


Douglas County
El Dorado County
Zephyr Cove
McFaul Creek
South Zephyr Creek
North Zephyr Creek
Lincoln Creek
Burke Creek
Edgewood Creek
50SSWA
5005
5006
5006a
5006b
5007
5008
5009
5010
5011
5012
5013a
5013b
5014
5015
5016
5017
5018
5019
5001
5002
5003
760
20701
20704
20705
20706
20707
20708-20709
20710
20711
20712
50
Esri, USDA Farm Service Agency
N
S
E
W
Catchment Connectivity Estimates
Disconnected
1% - 20%
21% - 40%
41% - 60%
61% - 80%
81% - 100%
0
0.5
1
Miles
NDOT - Douglas County
Catchment Connectivity
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District

APPENDIX D- CATCHMENT PROPERTIES

WASHOE COUNTY CATCHMENT PROPERTIES					
PLRM v2.1 Catchment Parameters					
No.	**Description**	**Catchment Label**	**Area (acres)**	**Slope (%)**	**Connectivity (%)**
Above SR431 discharging to Deer Creek					
1	IV Apollo Way & Jupiter Dr	WC15	76.4	15	100
Above SR431 discharging to Rosewood Creek					
2		WC09	7.2	15	100
3	IV Geraldine Dr & Jennifer St	WC13	100.2	20	100
Above SR431 discharging to Third Creek					
4		WC08	9.4	15	100
5	IV Marlette Way & Jennifer St	WC14	40.8	15	100
Above SR431 discharging to Wood Creek					
6	IV Tyner Way & Valerie Ct to Wood Creek	C01	20.6	20	100
7		C05	4.8	25	100
8	IV Barbra St	C03b	4.1	25	100
9	IV Allison Dr	WC12	71.2	20	80
10	IV Tyner Way & Jennifer St intersection	C06	2.4	20	60
11	IV Upper Tyner Way & Dorcey Dr	C02	45.4	15	0
12	IV Barbra St	C03a	16.1	25	0
13	IV Harper Ct	WC11	1.7	20	0
Below SR431 discharging to Wood Creek					
14	Southwood Blvd/Job Peak to Wood Creek	C07	87.4	10	100
15	IV Winding Way & Northwood Blvd	J01	57.2	10	100
16	IV McCourry Blvd discharge & Alder Ave	C04	16.4	15	100
Discharging to Burnt Cedar Creek					
17	Burnt Cedar Creek drainage below Mays Blvd	E02	38.7	5	100
18	IV Burnt Cedar Beach	F01	21.3	5	100
19	IV Allen Way & old Incline Elementary Bldg	E01	16.9	15	100
Crystal Bay Area discharging to Lake Tahoe					
20	Crystal Bay SFR below Hwy 28	WC65	82.3	30	100
21	Crystal Bay SFR above Hwy 28	WC61b	53.4	30	100
22	Crystal Bay Casino	WC63	2.9	5	100
23	Crystal Bay Soomers Loop & CalNeva Dr	WC64	48.9	30	80
24	Crystal Bay Biltmore	WC62	6.6	5	60
25	Crystal Bay SFR above Hwy 28	WC61a	41.2	30	20
DiamondPeak & Tyrol Village					
26	IV Tyrolian Village	WC36	84.7	15	100
27	Diamond Peak Ski Area, IV	WC68	9.3	15	100
East Incline Village castoff discharging to Lake Tahoe					
28		EastIV	12.6	1	100
Discharging to FirstCreek					
29	IV First Creek	A01	43.5	20	100
30	IV Upper Tyner Way to First Creek	A04	35.1	25	100
31	IV Sugarpine Dr	A02a	2.8	20	100
32	IV Sugarpine Dr	A02b	2.1	20	100
33	IV Tumbleweed Drive SFR	A05	9.8	15	20
34	IV Dale Dr	A03	4.2	30	20

WASHOE COUNTY CATCHMENT PROPERTIES (continued)					
PLRM v2.1 Catchment Parameters					
No.	Description	Catchment Label	Area (acres)	Slope (%)	Connectivity (%)
Crystal Shores & Lakeshore Terrace Condos discharging to Lake Tahoe					
35	IV Crystal Shores	G01	13.2	15	100
36	Lakefront Condos Lakeshore Terr - east	WC01	6.4	25	100
37	Lakefront Condos Lakeshore Terr - west	WC02	3.8	25	100
38		WC03	3.3	25	100
Discharging to Mill Creek					
39	IV GID Public Works	WC60	96.8	15	100
40	IV Lakeshore Blvd from Country Club to Pinecone Cir	WC23	89.0	5	100
41	IV SFR below Hwy 28 east shore	WC67	12.5	10	100
42		WC34b	3.2	5	100
43	IV Mill Crk drainage below Hwy 28	WC24	107.5	5	80
44	IV, former Ponderosa Ranch area	WC26	51.6	15	80
45	IV south of former Ponderosa Ranch	WC28a	20.5	20	80
46	IV Tomahawk Dr & industrial bldgs	WC31	14.0	15	80
47	IV Mill Crk drainage below Hwy 28	WC25	3.2	5	80
48	IV south of former Ponderosa Ranch	WC28b	10.2	20	20
49		WC24a	6.7	5	0
50	IV Peace Pipe Ln	WC30	3.5	10	0
Discharging to SecondCreek					
51	IV Ponderosa Ave to Second Creek	B01	19.4	20	100
52	IV Second Creek Dr to Second Creek	B02	139.4	20	100
53	IV Upper Second Creek Dr to Second Creek	B03	2.3	20	100
54	IV Tyner Way & Michael Ct	B04	41.1	10	60
55	IV Tyner Way & Lariat Cir	B06	23.2	25	100
56	Upper Tyner	B07	17.3	30	100
57	IV Lakeshore Blvd to Second Creek	B08	36.4	10	100
58	IV Woodridge Cir	W01	19.8	20	100
Discharging to ephemeral creek near Preston Field					
59	Incline Creek Sewer Creek below Hwy 28	D07	61.9	10	100
60	Preston Field, Gary Ct	D06	26.8	10	80
61	IV Tyner Way & Lariat Way	D04	24.8	20	80
62	IV Betty Ln & Kelly Dr	D02	15.9	15	80
63	Washoe County Maintenance Bldg	D05	14.3	10	80
64	IV Winding Way & Linda Ct	D03	12.5	5	80
65	IV Tyner Way & Valerie Ct	Y01	25.2	15	20
66	IV Tyner Way & Dorcely Dr intersection	D01	5.5	10	20
Above SR431 dischariging to CIVph1					
67	IV Tyner Way & Gale St	X01	38.7	15	100
Single Family Residential discharging to Lake Tahoe (via lakeshore condos)					
68	IV Pinion Dr	Z01a	53.0	20	100
69	Inlcine Village Knotty Pine Dr & Sugarpine Dr	Z01b	26.9	20	100

WASHOE COUNTY CATCHMENT PROPERTIES (continued)					
PLRM v2.1 Catchment Parameters					
No.	**Description**	**Catchment Label**	**Area (acres)**	**Slope (%)**	**Connectivity (%)**
Fairway/Fairview WQIP Phase III discharging to Deer, Third and Incline Creeks (FF3_UDC)					
70	FF3 IC	Incline3	71.0	15	100
71	FF3 IC	Incline1	64.7	15	100
72	FF3 IC	Incline6	59.1	15	100
73	FF3 LDC	LwrDr1	58.3	15	100
74	FF3 U3C	UTC2	50.9	15	100
75	FF3 LDC	LwrDr2	47.8	15	100
76	FF3 UDC	UpDr1	47.4	15	100
77	FF3 3C	Third2	39.8	15	100
78	FF3 UDC	UpDr2b	37.8	15	100
79	FF3 IC	Incline2	35.6	15	100
80	FF3 IC	Incline5	34.2	15	100
81	FF3 3C	Third6a	31.9	15	100
82	FF3 3C	Third5c	22.1	15	100
83	FF3 3C	Third4	21.5	15	100
84	FF3 U3C	UTC1	20.9	15	100
85	FF3 UDC	UDCf	10.1	15	100
86	FF3 UDC	UDCl	7.0	15	100
87	FF3 UDC	UDCe	6.2	15	100
88	FF3 UDC	UDCh	4.9	15	100
89	FF3 UDC	UDCk	4.8	15	100
90	FF3 UDC	UpDr2a	3.8	15	100
91	FF3 IC	Incline4	3.4	15	100
92	FF3 UDC	UDCj	1.2	15	100
Fairway/Fairview WQIP Phase III discharging to Rosewood Creek (FF3_RWC)					
93	FF3 LRWC	Third5a	52.1	5	100
94	FF3 3C	Third1	33.3	10	100
95	FF3 RWC	RW3	30.5	10	100
96	FF3 3C	Third3	22.4	10	100
97	FF3 LRWC	Third6b	22.2	10	100
98	FF3 RWC	RW2	16.6	10	100
99	FF3 RWC	RW1	16.2	10	100
Central Incline Village WQIP Phase I (CIVph1)					
100	Central IV Phase	WdTrib1	81.0	10	100
101		RWCUpr	58.1	10	100
102		RWClwer	56.3	10	100
103		WoodCrk	33.0	10	100
104		ThirdCrk	25.2	10	80

WASHOE COUNTY CATCHMENT PROPERTIES (continued)					
PLRM v2.1 Catchment Parameters					
No.	**Description**	**Catchment Label**	**Area (acres)**	**Slope (%)**	**Connectivity (%)**
Central Incline Village WQIP Phase II (CIVph2)					
105	Central IV Phase 2 Model 1	CIVPh2_2	33.9	10	100
106	Central IV Phase 2_5_11	CIVPh2_5	24.0	5	100
107	Central IV Phase 2 Model 2	CIVPh2_12	23.2	5	100
108	Central IV Phase 2_10	CIVPh2_10	23.2	5	100
109	Central IV Phase 2_15	CIVPh2_15	18.9	5	100
110	Central IV Phase 2_13	CIVPh2_13	16.1	5	100
111	Central IV Phase 2 Model 1	CIVPh2_9	14.6	5	100
112	Central IV Phase 2_5_11	CIVPh2_11	13.2	5	100
113	Central IV Phase 2_1	CIVPh2_1	10.7	5	100
114	Central IV Phase 2 Model 1	CIVPh2_14	7.5	5	100
115	Central IV Phase 2 Model 1	CIVPh2_3	6.6	5	100
116	Central IV Phase 2 Model 1	CIVPh2_7	6.4	5	100
117	Central IV Phase 2 Model 2	CIVPh2_6	5.6	5	100
118	Central IV Phase 2 Model 2	CIVPh2_8	4.1	5	100
East Incline Village WQIP (EIV)					
119	IV upper Ski Way MFR, East IV CICU	WC32A	52.2	5	100
120	Incline Catchment 1 Lower Country Club Drive	IC1-D	48.8	5	100
121	IV between Hwy 28 & Incline Way	WC20A	39.8	5	100
122	Incline Catchment 1 Lower Country Club Drive	IC1-B	33.0	5	100
123	IV between Hwy 28 & Incline Way	WC20C	30.5	5	100
124	Incline Catchment 1 Lower Country Club Drive	IC1-A	27.0	5	100
125	IV upper Ski Way MFR, East IV CICU	WC33A	26.6	5	100
126	Incline Catchment 1 Lower Country Club Drive	IC1-C	25.2	5	100
127	IV Third Creek HOA & Raleys Center	WC48	22.3	5	100
128	IV between Hwy 28 & Incline Way	WC20B	16.8	5	100
129	IV upper Ski Way MFR, East IV CICU	WC33B	9.5	5	100
130	East IV- Country Club-Dr/Hwy 28 junction	WC34	4.8	5	100
131	IV upper Ski Way MFR, East IV CICU	WC33D	4.6	5	100
132	Incline Catchment 1 Lower Country Club Drive	IC2-B	2.1	5	100
133	IV Incline Way	WC19	1.6	5	100
134	Incline Catchment 1 Lower Country Club Drive	IC2-A	1.3	5	100
135	IV War Bonnet Way	WC29	15.5	5	80
136	IV Rosewood & Third Creeks btw. Hwy 28 & Lakeshore Blvd	WC22A	32.2	5	60
137	IV Third Creek HOA & Raleys Center	WC47	28.5	5	60
138	IV Rosewood & Third Creeks btw. Hwy 28 & Lakeshore Blvd	WC22B	4.5	5	60
139	IV upper Ski Way MFR, East IV CICU	WC32B	27.5	5	0
140	IV upper Ski Way MFR, East IV CICU	WC33C	1.4	5	0
Total Area (acres)			**3922**		

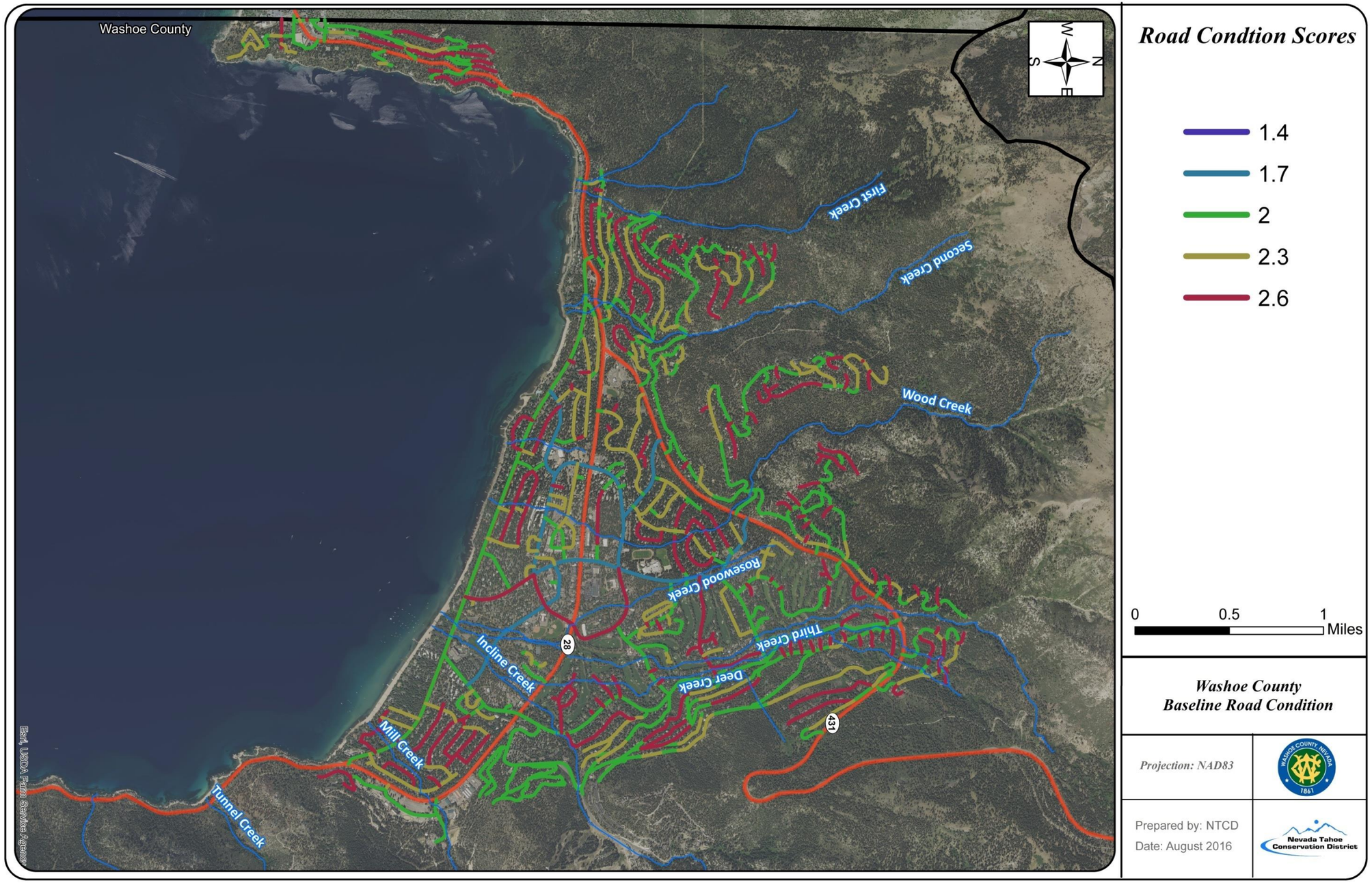
NDOT CATCHMENT PROPERTIES PLRM v2.1 Catchment Parameters					
No.	Catchment Label	Urban Area (acres)	Area (acres)	Slope (%)	Connectivity (%)
SR207					
1	20701	2.5	2.7	5	100
2	20705	1.1	1.6	5	100
3	20702	0.8	0.8	5	100
4	20706	0.6	0.9	5	100
5	20703	0.5	0.7	5	100
6	20704	5.3	7.5	5	65
7	20709	1.6	2.0	5	65
8	20711	1.3	3.3	5	65
9	20708	1.0	1.7	5	65
10	20710	0.4	1.2	5	65
11	20712	3.1	5.9	5	60
12	20707	0.7	1.2	5	Disconnected
SL2ElksPt					
13	5005	3.5	3.5	1	100
14	50SSWA	3.3	3.3	1	100
15	5007	1.9	1.9	1	100
16	5006b	4.6	5.1	1	40
17	5015	4.8	5.7	1	Disconnected
BRC_HWY50xing					
18	5008	1.1	1.1	1	100
19	5006a	0.7	0.7	1	80
20	5009	1.7	1.8	1	35
SR760					
21	760	3.6	3.6	1	60
ElksPt2ZCPrj					
22	5011	2.6	3.2	1	100
23	5016	0.9	3.4	1	100
24	5012	1.6	1.7	5	45
25	5010	3.9	4.0	5	10
ZCPrj					
26	5002	4.3	5.1	5 and 1	100
27	5013a	1.8	1.9	1	100
ZC2Marla					
28	5013b	2.0	2.2	1	100
29	5003	6.0	6.1	1	40
Marla2CR					
30	5017	4.0	8.7	5	100
31	5019	2.2	2.3	5	100
32	5018	1.4	1.4	5	100
33	5014	5.0	5.0	1	85
34	5001	6.3	6.3	1	5

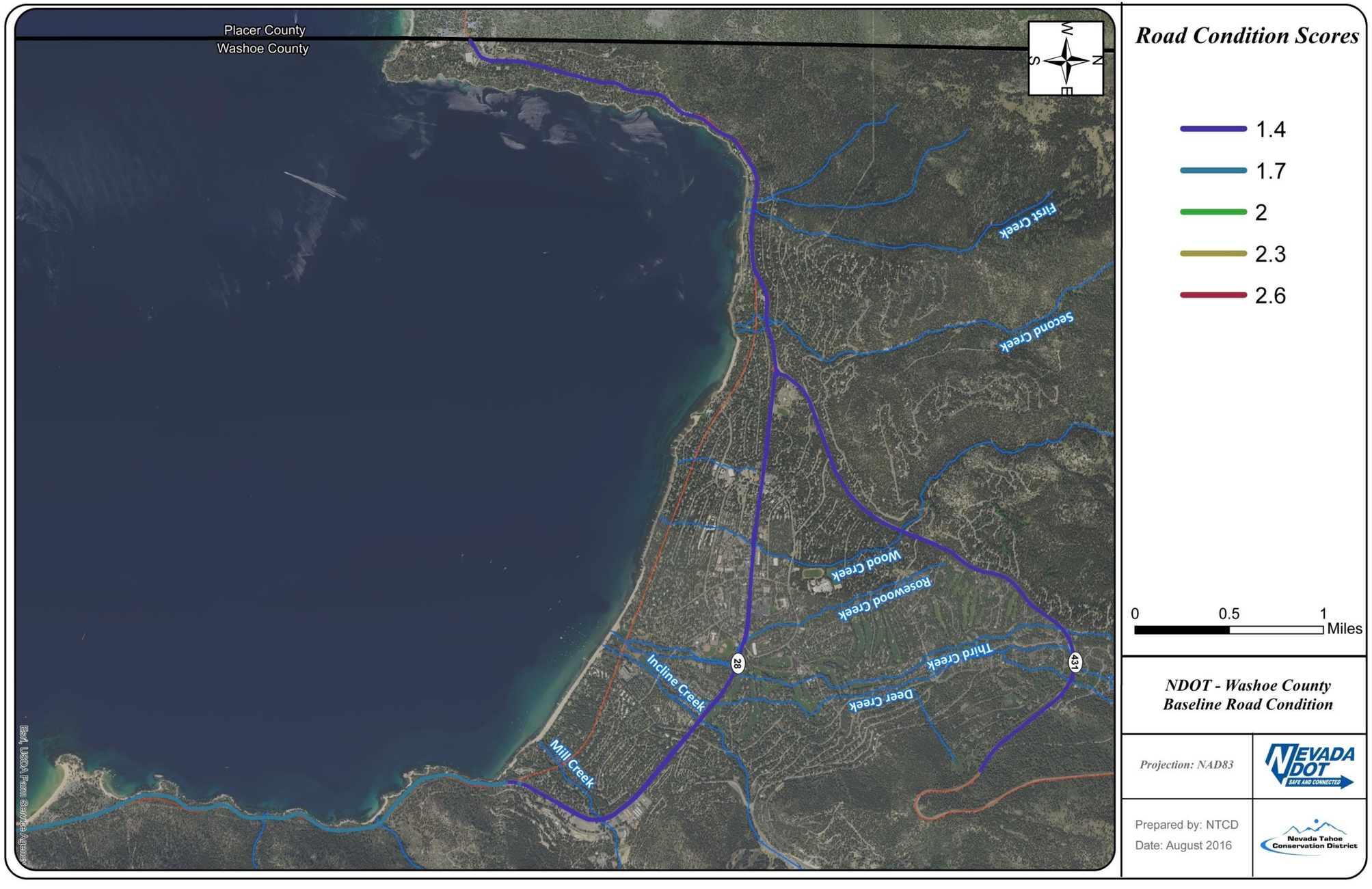
NDOT CATCHMENT PROPERTIES (continued)					
PLRM v2.1 Catchment Parameters					
No.	Catchment Label	Urban Area (acres)	Area (acres)	Slope (%)	Connectivity (%)
PittmanTerrace					
35	501ad	3.6	9.5	1	100
36	501i	0.4	1.2	1	20
PT2Logan					
37	505a	1.2	3.3	5	100
38	502	4.3	12.2	5	40
39	503	2.7	8.6	1	40
40	504	1.4	2.8	5	10
Logan2Gbrk					
41	505b	3.4	8.1	1	50
42	506	5.5	10.4	1	Disconnected
Gbrk2Summit					
43	510	5.0	18.7	5	100
44	512	1.4	7.4	5	100
45	511	2.8	9.3	5	60
46	509	3.2	8.5	5	55
47	513	3.1	10.0	5	45
48	514	2.7	4.5	5	20
49	507	8.7	12.6	5	Disconnected
50	515	4.3	6.3	5	Disconnected
51	508	2.8	7.0	5	Disconnected
SR28_DC					
52	2838	1.2	2.4	1	100
53	2803	4.7	9.2	1	Disconnected
54	2801	2.3	3.0	1	Disconnected
55	2802	1.3	3.0	1	Disconnected
SR28_CC					
56	2831	0.9	2.4	1	100
57	2836	0.7	1.4	5	100
58	2835	0.4	1.4	1	100
59	2839	0.3	1.1	10	100
60	2843	0.3	1.2	5	100
61	2833	0.6	2.1	1	80
62	2840	0.6	2.2	1	55
63	2845	1.6	3.6	5	50
64	2841	0.9	2.6	1	20
65	2830	0.5	1.0	1	20
66	2832	1.0	4.1	1	15
67	2834	3.6	14.4	5	Disconnected
68	2842	3.1	6.9	5	Disconnected
69	2844	2.4	6.1	1	Disconnected
70	2828	0.8	1.8	1	Disconnected
71	2837	0.3	0.8	5	Disconnected

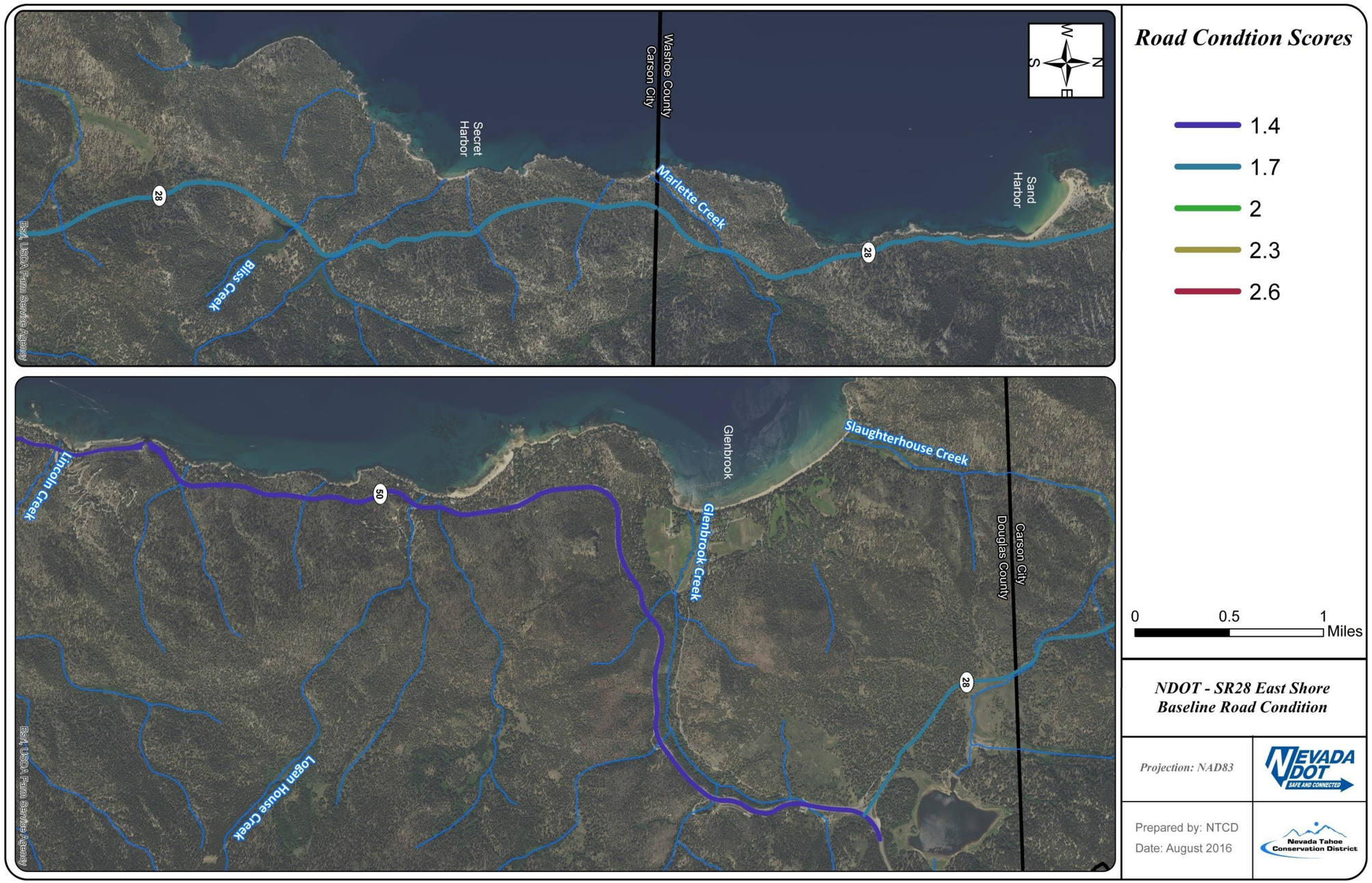
NDOT CATCHMENT PROPERTIES (continued)					
PLRM v2.1 Catchment Parameters					
No.	Catchment Label	Urban Area (acres)	Area (acres)	Slope (%)	Connectivity (%)
SR28-Atkins					
72	Atk2	1.3	3.3	10	100
73	Atk5	1.0	3.4	5	100
74	Atk8	0.6	1.4	1	100
75	Atk6	1.6	5.9	5	80
76	Atk7	0.9	1.7	5	60
77	Atk10	0.9	1.6	1	60
78	Atk3	1.1	3.0	5	35
79	Atk1	2.0	4.4	5	25
80	Atk4	1.2	3.9	5	25
81	Atk9	2.4	6.2	1	10
SR28_WC					
82	2820	3.8	10.4	1	100
83	2825	1.3	3.5	1	100
84	2824	1.0	2.3	1	100
85	2823	0.9	2.1	1	100
86	2852	0.2	0.7	1	100
87	2827	2.0	3.6	1	80
88	2846	1.6	4.3	1	80
89	2826	1.0	3.2	1	80
SR28-MRtoLB					
90	2804	3.1	6.9	1	100
91	2808	2.5	5.5	1	100
92	2816	2.5	4.4	5	100
93	2815	1.3	2.1	1	100
94	2805	1.2	3.0	5	100
95	2814	1.2	3.0	5	100
96	2813	1.1	4.2	1	100
97	2863Gn	1.0	5.3	5	100
98	2863	0.8	1.7	5	100
99	2850A	0.5	1.1	5	100
100	2864	0.5	2.1	5	100
101	2850BGn	2.1	4.9	5	80
102	2809	1.5	3.7	5	80
103	2850B	1.4	2.0	1	80
104	2818	1.2	3.8	5	80
105	2851	1.0	2.4	1	80

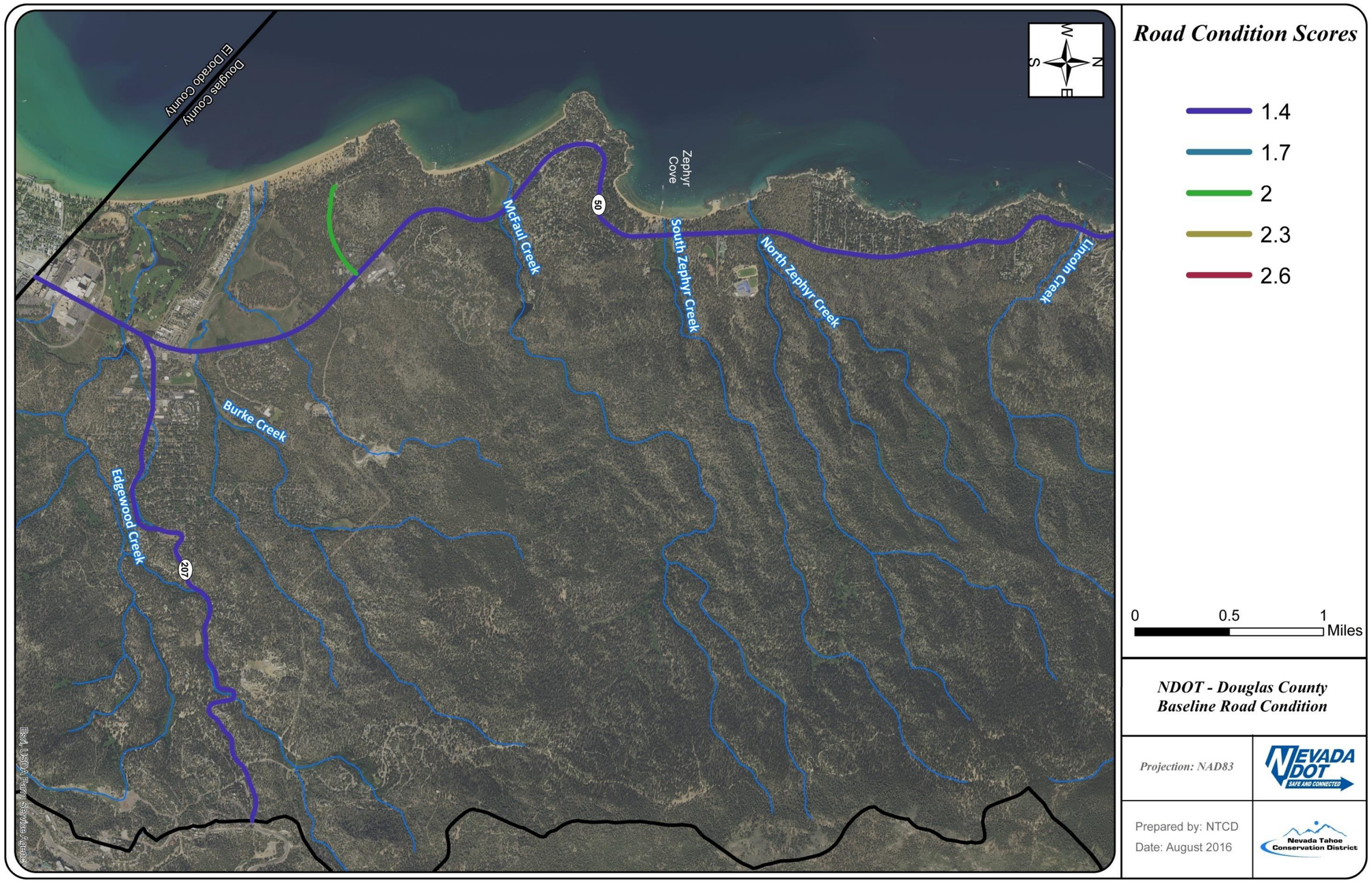
NDOT CATCHMENT PROPERTIES (continued)					
PLRM v2.1 Catchment Parameters					
No.	Catchment Label	Urban Area (acres)	Area (acres)	Slope (%)	Connectivity (%)
SR28-CBtoMR					
106	2858	2.5	5.6	5	100
107	2861	2.3	10.2	5	100
108	2821	1.7	5.3	1	100
109	2855	1.7	6.0	5	100
110	2856	0.8	3.3	5	100
111	2810	0.7	2.7	5	100
112	2854	0.5	2.3	5	100
113	2857	0.5	2.1	1	100
114	2853	0.4	1.8	5	100
115	2860	1.4	1.6	5	60
116	2859	2.4	4.9	1	20
SR431					
117	431005	6.8	13.9	10	100
118	431002	2.2	4.2	10	100
119	431050	2.0	5.4	10	100
120	431004	1.9	6.0	10	100
121	431009	1.8	6.2	10	100
122	431010c	1.5	4.7	10	100
123	431007b	1.3	5.5	10	100
124	431011	1.2	3.4	10	100
125	2862	1.1	3.7	10	100
126	431003	0.9	2.5	10	100
127	431001	0.8	2.2	10	100
128	431019	0.8	2.9	10	100
129	431008	0.6	1.8	10	100
130	431018	0.6	1.6	10	100
131	431020	0.6	2.4	10	100
132	431006b	0.4	1.6	10	100
133	431010a	0.4	6.3	10	100
134	431013	0.4	1.9	10	100
135	431006a	0.6	2.0	10	Disconnected
136	431007a	0.6	2.3	10	Disconnected
Total Area (acres)		**258**	**563**		

APPENDIX E- BASELINE ROAD CONDITIONS

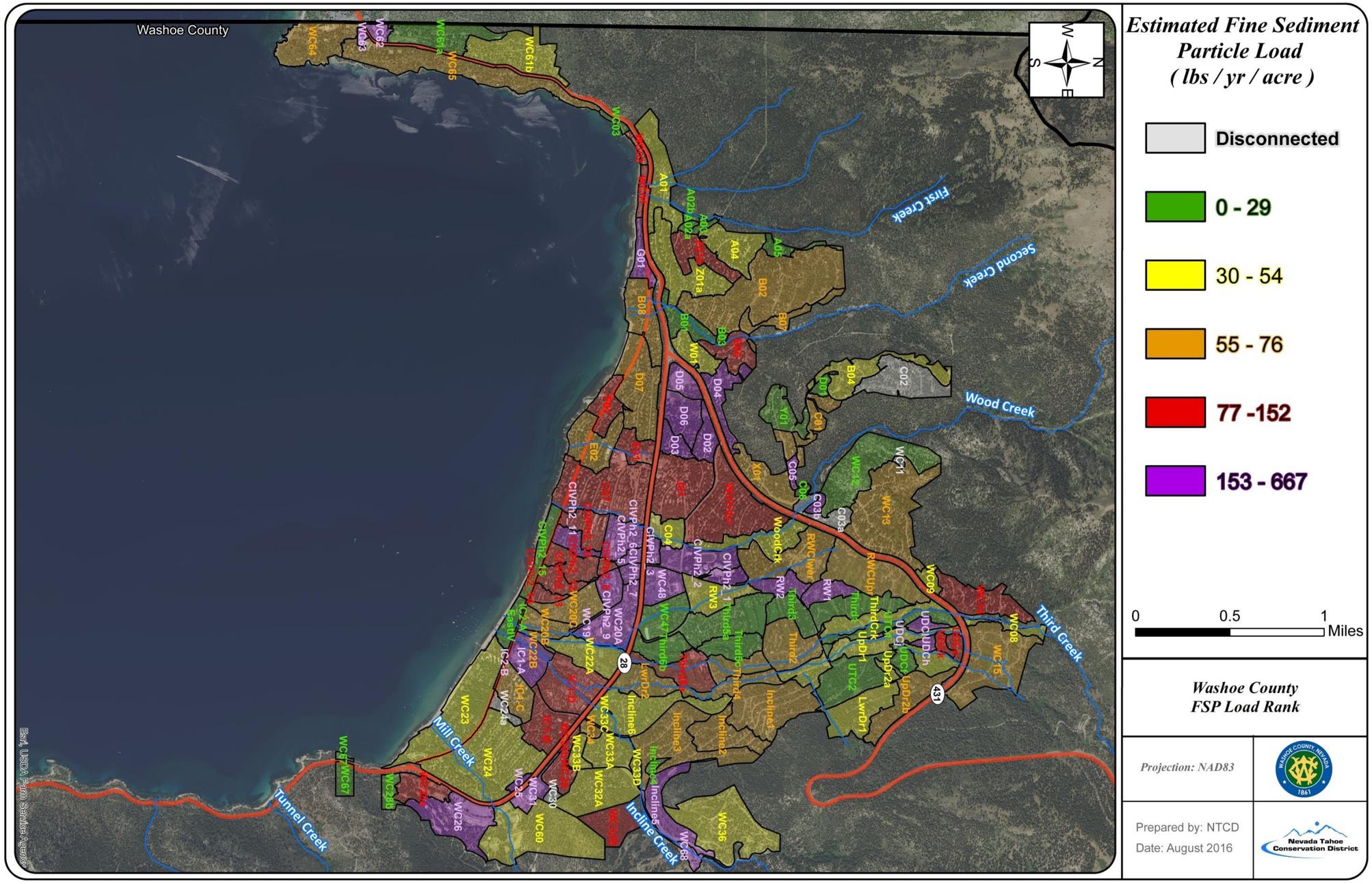

Washoe County
W
S
N
First Creek
Second Creek
Wood Creek
Rosewood Creek
Third Creek
Deer Creek
Incline Creek
Mill Creek
Tunnel Creek
28
431
Esri, USDA Farm Service Agency
Road Condtion Scores
1.4
1.7
2
2.3
2.6
0
0.5
1
Miles
Washoe County
Baseline Road Condition
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District

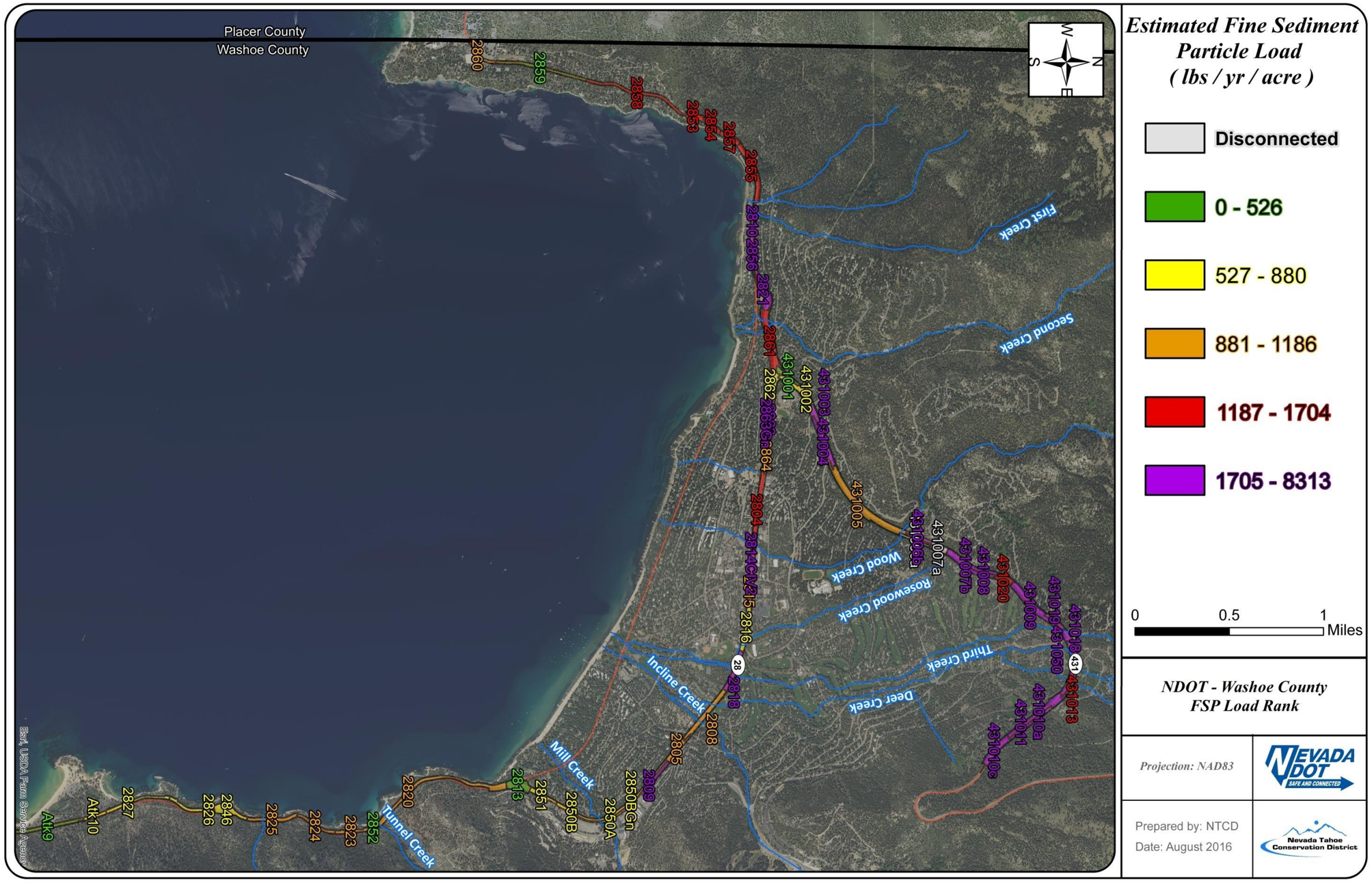

Placer County
Washoe County
W
S
N
E
First Creek
Second Creek
Wood Creek
Rosewood Creek
Third Creek
Deer Creek
Incline Creek
Mill Creek
28
431
Esri, USDA Farm Service Agency
Road Condition Scores
1.4
1.7
2
2.3
2.6
0
0.5
1
Miles
NDOT - Washoe County
Baseline Road Condition
Projection: NAD83
NEVADA DOT
SAFE AND CONNECTED
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District

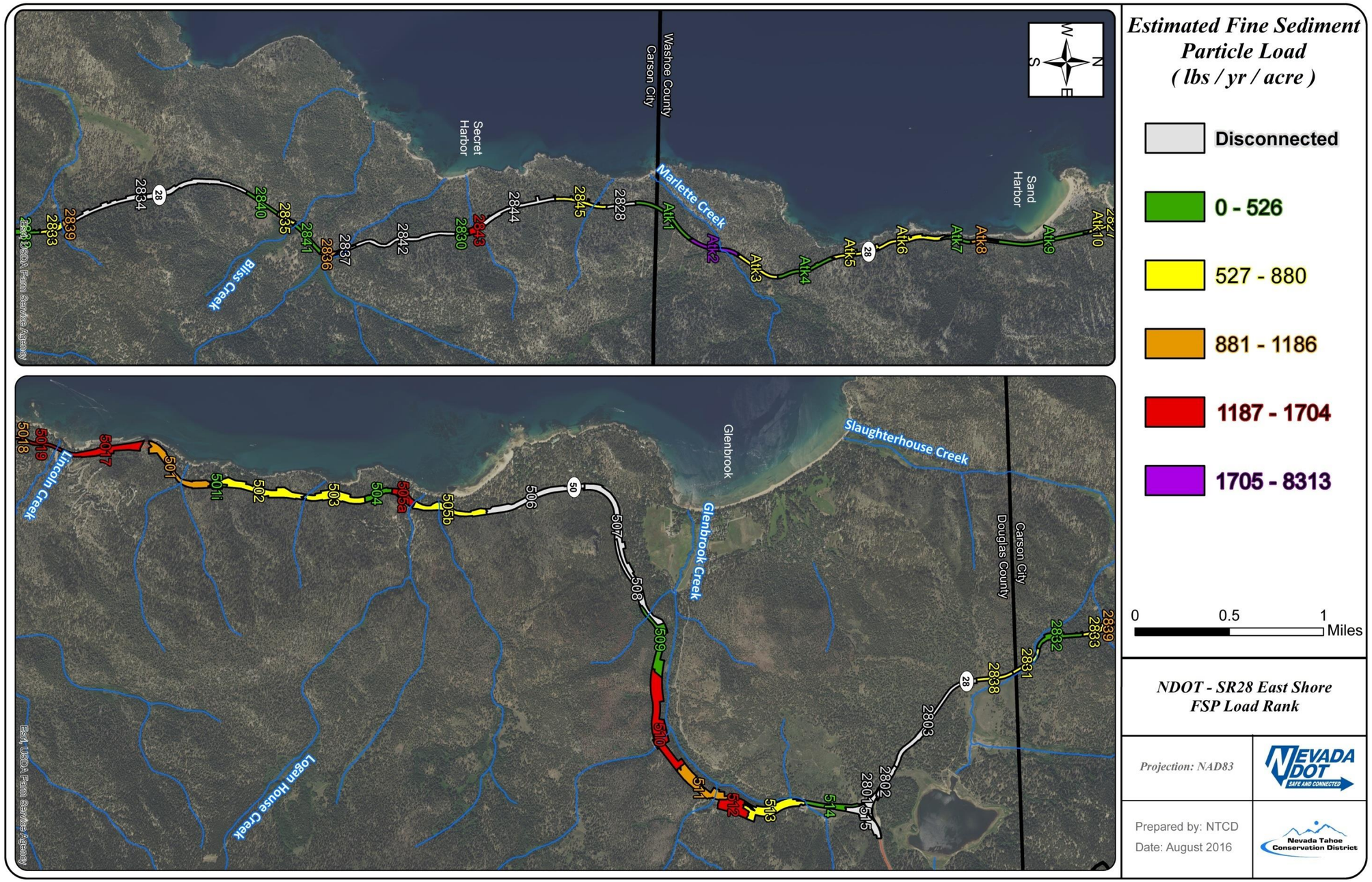

Washoe County
Carson City
Secret Harbor
Sand Harbor
Marlette Creek
Bliss Creek
28
Esri, USDA Farm Service Agency
Lincoln Creek
50
Glenbrook
Glenbrook Creek
Slaughterhouse Creek
Douglas County
Carson City
Logan House Creek
Esri, USDA Farm Service Agency
W
S
N
E
Road Condtion Scores
1.4
1.7
2
2.3
2.6
0
0.5
1
Miles
NDOT - SR28 East Shore
Baseline Road Condition
Projection: NAD83
NEVADA DOT
SAFE AND CONNECTED
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District

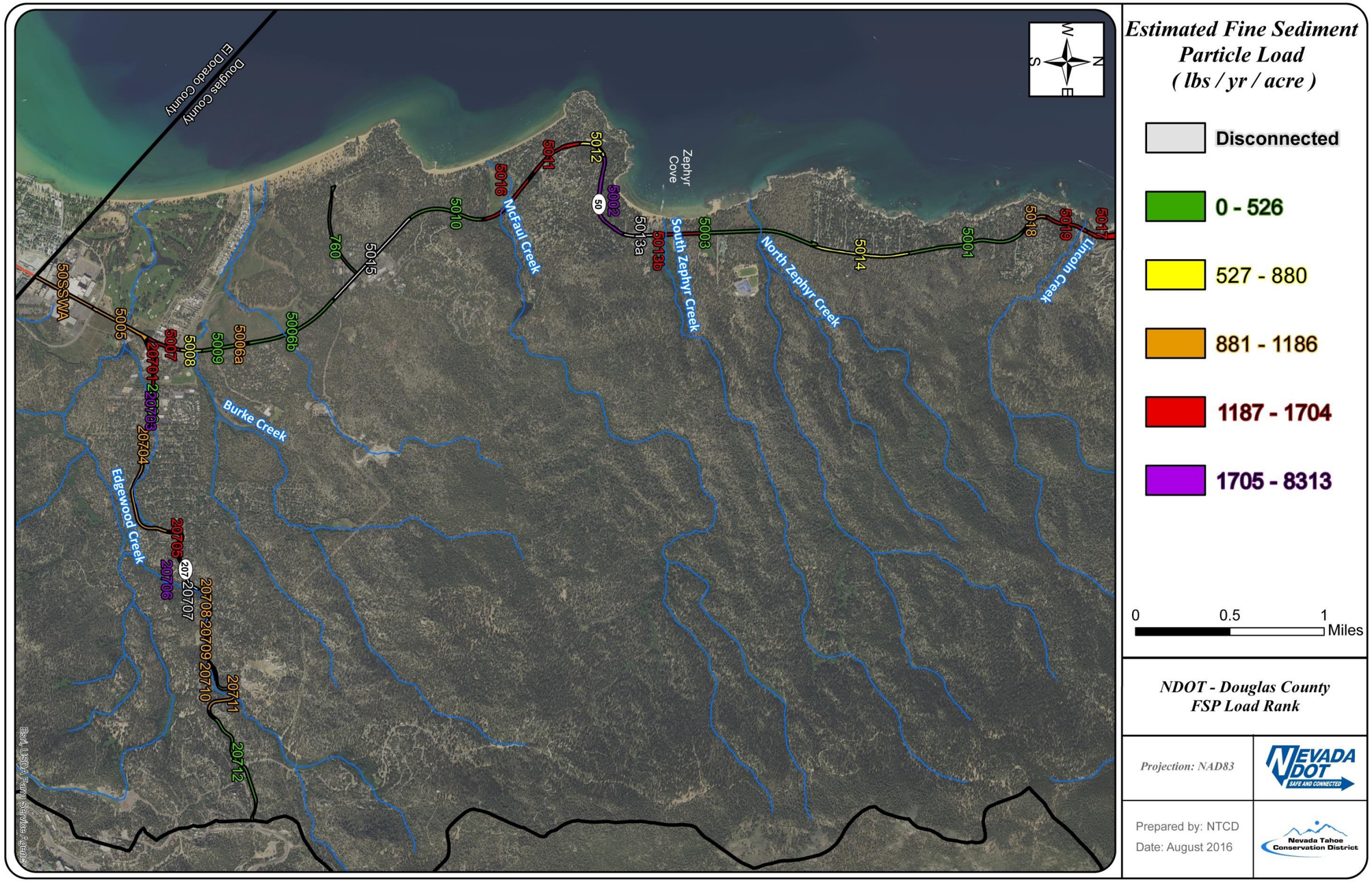

Douglas County
El Dorado County
Zephyr Cove
50
McFaul Creek
South Zephyr Creek
North Zephyr Creek
Lincoln Creek
Burke Creek
Edgewood Creek
207
Esri, USDA Farm Service Agency
W
S
N
E
Road Condition Scores
1.4
1.7
2
2.3
2.6
0
0.5
1
Miles
NDOT - Douglas County
Baseline Road Condition
Projection: NAD83
NEVADA DOT
SAFE AND CONNECTED
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District

APPENDIX F- FSP LOAD RANK


Washoe County
Esri, USDA Farm Service Agency
First Creek
Second Creek
Wood Creek
Third Creek
Mill Creek
Tunnel Creek
Incline Creek
28
431
Estimated Fine Sediment Particle Load (lbs / yr / acre)
Disconnected
0 - 29
30 - 54
55 - 76
77 -152
153 - 667
0
0.5
1
Miles
Washoe County FSP Load Rank
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District


Placer County
Washoe County
2860
2859
2858
2853
2854
2857
2855
2810
2856
2821
2861
2862
2863a
2864
2804
2814
2815
2816
28
2818
2808
2805
2809
2850BGn
2850A
2850B
2851
2813
2820
2852
2823
2824
2825
2826
2846
2827
Atk10
Atk9
431001
431002
431003
431004
431005
431006
431007a
431007b
431008
431020
431009
431019
431010
431018
431
431013
431010a
431011
431010c
First Creek
Second Creek
Third Creek
Deer Creek
Wood Creek
Rosewood Creek
Incline Creek
Mill Creek
Tunnel Creek
Esri, USDA Farm Service Agency
W
S
N
E
Estimated Fine Sediment Particle Load (lbs / yr / acre)
Disconnected
0 - 526
527 - 880
881 - 1186
1187 - 1704
1705 - 8313
0
0.5
1
Miles
NDOT - Washoe County FSP Load Rank
Projection: NAD83
NEVADA DOT SAFE AND CONNECTED
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District


Washoe County
Carson City
Secret Harbor
Sand Harbor
Marlette Creek
Bliss Creek
Glenbrook
Glenbrook Creek
Slaughterhouse Creek
Lincoln Creek
Logan House Creek
Douglas County
Carson City
Esri, USDA Farm Service Agency
Estimated Fine Sediment Particle Load (lbs / yr / acre)
Disconnected
0 - 526
527 - 880
881 - 1186
1187 - 1704
1705 - 8313
0
0.5
1
Miles
NDOT - SR28 East Shore FSP Load Rank
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District


Douglas County
El Dorado County
Zephyr Cove
McFaul Creek
South Zephyr Creek
North Zephyr Creek
Lincoln Creek
Burke Creek
Edgewood Creek
50SSWA
5005
5007
5008
5009
5006a
5006b
760
5015
5010
5016
5011
5012
50
5002
5013a
5013b
5003
5014
5001
5018
5019
5017
2e701
20703
20704
20705
20
20707
20706
20708
20709
20710
20711
20712
Esri, USDA Farm Service Agency
Estimated Fine Sediment Particle Load (lbs / yr / acre)
Disconnected
0 - 526
527 - 880
881 - 1186
1187 - 1704
1705 - 8313
0
0.5
1
Miles
NDOT - Douglas County FSP Load Rank
Projection: NAD83
Prepared by: NTCD
Date: August 2016
Nevada Tahoe Conservation District

APPENDIX G- BASELINE LOAD RESULTS BY CATCHMENT

WASHOE COUNTY BASELINE LOAD ESTIMATE RANKING

PERCENTILE	RANK	FSP RANGE (lbs/yr/acre)
81-100TH	5	153-667
61-80TH	4	77-152
41-60TH	3	55-76
21-40TH	2	30-54
0-20TH	1	0-29

WASHOE COUNTY FSP LOAD RANK

PLRM v2.1 Baseline Load Results

Catchment	FSP (lb/yr)	FSP (lb/yr/acre)	TP (lb/yr)	TN (lb/yr)	Rank
Above SR431 discharging to Deer Creek					
WC15	5420	71	25	96	3
Above SR431 discharging to Rosewood Creek					
WC13	7608	76	31	118	3
WC09	353	49	2	8	2
Above SR431 discharging to Third Creek					
WC14	4619	113	19	75	4
WC08	324	35	1	4	2
Above SR431 discharging to Wood Creek					
C03b	844	204	3	11	5
C05	812	168	3	11	5
C01	1487	72	6	26	3
WC12	1387	19	6	24	1
C06	25	10	0	0	1
C02					Disconnected
C03a					Disconnected
WC11					Disconnected
Below SR431 discharging to Wood Creek					
C07	11499	132	51	200	4
J01	6074	106	25	99	4
C04	746	46	3	10	2
Discharging to Burnt Cedar Creek					
E01	2146	127	9	33	4
F01	2088	98	8	29	4
E02	2836	73	13	51	3

WASHOE COUNTY FSP LOAD RANK (continued)					
PLRM v2.1 Baseline Load Results					
Catchment	FSP (lb/yr)	FSP (lb/yr/acre)	TP (lb/yr)	TN (lb/yr)	Rank
Crystal Bay Area discharging to Lake Tahoe					
WC63	1961	667	7	26	5
WC62	2676	406	10	35	5
WC64	3740	76	14	52	3
WC65	5198	63	23	90	3
WC61b	2676	50	12	49	2
WC61a	540	13	2	8	1
DiamondPeak & Tyrol Village					
WC68	3568	382	14	48	5
WC36	3942	47	27	131	2
East Incline Village castoff discharging to Lake Tahoe					
EastIV	282	22	1	4	1
Discharging to FirstCreek					
A01	2324	53	10	39	2
A04	911	26	5	23	1
A03	96	23	0	1	1
A02a	69	25	0	2	1
A05	201	20	1	3	1
A02b	2	1	0	0	1
Crystal Shores & Lakeshore Terrace Condos discharging to Lake Tahoe					
G01	2457	185	12	52	5
WC02	407	107	3	14	4
WC01	660	103	5	22	4
WC03	2	1	0	0	1
Discharging to Mill Creek					
WC25	2034	644	8	36	5
WC31					1
WC26	7975	155	30	102	5
WC34b	353	112	1	4	4
WC28a	2054	100	8	27	4
WC24	5316	49	23	87	2
WC60	4159	43	15	51	2
WC27					
WC23	3453	39	20	74	2
WC67	11	1	0	1	1
WC28b	1	0	0	0	1
WC24a					Disconnected
WC30					Disconnected

WASHOE COUNTY FSP LOAD RANK (continued)					
PLRM v2.1 Baseline Load Results					
Catchment	**FSP (lb/yr)**	**FSP (lb/yr/acre)**	**TP (lb/yr)**	**TN (lb/yr)**	**Rank**
Discharging to SecondCreek					
B06	2701	116	10	37	4
B02	10251	74	43	162	3
B08	2269	62	9	34	3
W01	1028	52	5	20	2
B07	945	55	3	12	2
B04	1428	35	7	29	2
B01	340	18	2	9	1
B03	15	7	0	1	1
Discharging to ephemeral creek near Preston Field					
D02	5950	375	25	96	5
D03					
D04					
D05					
D06					
D07	4230	68	19	72	3
D01	113	21	0	2	1
Y01	361	14	2	6	1
Above SR431 dischariging to CIVph1					
X01	2805	72	13	47	3
Single Family Residential discharging to Lake Tahoe (via lakeshore condos)					
Z01b (B05)	2305	86	10	38	4
Z01a	2382	45	13	50	2

WASHOE COUNTY FSP LOAD RANK (continued)					
PLRM v2.1 Baseline Load Results					
Catchment	FSP (lb/yr)	FSP (lb/yr/acre)	TP (lb/yr)	TN (lb/yr)	Rank
Fairway/Fairview WQIP Phase III discharging to Deer, Third and Incline Creeks (FF3_UDC)					
UDCj	344	289	1	4	5
UDCl	1260	179	4	16	5
Incline5	5994	175	30	114	5
UDCh	842	173	3	12	5
UDCe	555	89	2	9	4
UDCk	410	86	2	6	4
UpDr2bPvCH	2523	67	10	36	3
UpDr2bTV					
Third6a	2437	76	10	39	3
Third2	2930	74	12	45	3
Incline1	4760	74	16	62	3
Incline2	2536	71	9	33	3
Incline 3	4751	67	17	63	3
Third4	1267	59	4	16	3
LwrDr2	2622	55	11	41	2
Incline 6	2959	50	11	38	2
LwrDr1	2661	46	10	37	2
UdDr2a	176	46	1	6	2
UpDr1	1674	35	6	23	2
Third5c	500	23	3	10	1
UDCf	168	17	1	3	1
UTC1	342	16	1	5	1
UTC2	378	7	3	18	1
Incline4	17	5	0	1	1
Fairway/Fairview WQIP Phase III discharging to Rosewood Creek (FF3_RWC)					
RW1	5074	155	20	58	5
RW2					
RW3	1100	36	6	26	2
Third1	3683	28	19	95	1
Third3					
Third5a					
Third6b					
Central Incline Village WQIP Phase I (CIVph1)					
WoodTrib1	9871	122	43	161	4
RWClower	4219	75	24	97	3
RWCupper	4218	73	19	74	3
WoodCreek	1391	42	9	34	2
ThirdCreek	948	38	5	19	2

WASHOE COUNTY FSP LOAD RANK (continued)					
PLRM v2.1 Baseline Load Results					
Catchment	FSP (lb/yr)	FSP (lb/yr/acre)	TP (lb/yr)	TN (lb/yr)	Rank
Central Incline Village WQIP Phase II (CIVph2)					
CIVph2_9	5073	348	17	59	5
CIVph2_7	1806	280	6	21	5
CIVph2_11	7423	200	28	102	5
CIVph2_5					
CIVph2_1	1953	182	7	24	5
CIVph2_2	7079	154	24	82	5
CIVph2_3					
CIVph2_6					
CIVph2_14	1104	146	5	17	4
CIVph2_8	3720	136	15	58	4
CIVph2_12					
CIVph2_13	1778	110	8	33	4
CIVph2_10	2075	89	10	41	4
CIVph2_15	144	8	3	13	1
CIVph2_4	not modeled in PLRM v2.1 (NDOT)				
East Incline Village WQIP (EIV)					
WC48	13760	222	52	184	5
WC20A					
IC2-B	410	199	1	5	5
IC1-A	5307	196	20	73	5
WC19	285	179	1	2	5
IC1-D	10549	129	41	150	4
IC1-B					
WC29	1200	78	4	16	4
WC32B					
IC1-C	1891	75	9	39	3
WC34	359	75	1	5	3
WC20B	3699	71	19	84	3
WC20C					
WC22B					
WC22A	1548	48	6	23	2
WC32A	3207	36	17	78	2
WC33B					
WC33A					
WC33D	142	31	1	2	2
WC33C					
WC47	804	28	5	25	1
IC2-A	33	25	0	0	1
Totals	**290412**	**11306**	**1228**	**4722**	
Credits	**1452**				

NDOT Baseline Load Estimate Ranking

PERCENTILE	RANK	FSP RANGE (lbs/yr/acre)
81-100th	5	1705-8313
61-80th	4	1187-1704
41-60th	3	881-1186
21-40th	2	527-880
0-20th	1	0-526

NDOT FSP LOAD RANK PLRM v2.1 Baseline Load Results					
Catchment	FSP (lbs/yr)	FSP (lb/yr/acre)	TP (lbs/yr)	TN (lbs/yr)	Rank
SR207					
20703	921	1842	2	6	5
20706	1053	1755	3	7	5
20705	1394	1267	4	10	4
20701	3008	1203	8	25	4
20710	451	1128	1	3	3
20708	1092	1092	3	8	3
20709	1660	1037	4	11	3
20711	1207	929	3	8	3
20704	4749	896	12	35	3
20712	417	135	1	6	1
20702	25	31	0	2	1
20707					Disconnected
SL2ElksPt					
5007	2322	1222	6	20	4
5005	3707	1059	11	32	3
50SSWA	3291	997	10	30	3
5006b	1506	327	4	12	1
5015					Disconnected
BRC_HWY50xing					
5006a	619	884	2	5	3
5008	911	828	2	7	2
5009	429	252	1	3	1
SR760					
760	1063	295	4	13	1

NDOT FSP LOAD RANK (continued)					
PLRM v2.1 Baseline Load Results					
Catchment	FSP (lbs/yr)	FSP (lb/yr/acre)	TP (lbs/yr)	TN (lbs/yr)	Rank
ElksPt2ZCPrj					
5016	3622	1393	9	27	4
5011	3837	1323	10	30	4
5012	977	611	3	7	2
5010	327	84	1	3	1
ZCPrj					
5002d	3916	4895	10	31	5
5002a	2577	1718	7	18	5
5002g	2778	1389	7	22	4
5013a					Disconnected
ZC2Marla					
5013b	2340	1232	6	20	4
5003	2193	366	6	18	1
Marla2CR					
5019	2911	1323	8	24	4
5017	5030	1258	14	42	4
5018	1656	1183	4	13	3
5014	2995	599	8	26	2
5001	376	60	1	3	1
PittmanTerrace					
501d	2319	1364	6	19	4
501a	1934	1018	5	16	3
501i	98	245	0	1	1
PT2Logan					
505a	1705	1421	4	13	4
502	2964	689	8	22	2
503	1701	630	4	13	2
504	222	159	1	2	1
Logan2Gbrk					
505b	2328	685	6	18	2
506					Disconnected

NDOT FSP LOAD RANK (continued)					
PLRM v2.1 Baseline Load Results					
Catchment	FSP (lbs/yr)	FSP (lb/yr/acre)	TP (lbs/yr)	TN (lbs/yr)	Rank
Gbrk2Summit					
512	2269	1621	6	19	4
510	6794	1359	18	57	4
511	2905	1037	8	24	3
513	2071	668	6	17	2
509	1655	517	4	14	1
514	886	328	2	7	1
507					Disconnected
508					Disconnected
515					Disconnected
SR28_DC					
2838	1011	843	3	10	2
2801					Disconnected
2802					Disconnected
2803					Disconnected
SR28_CC					
2843	380	1268	1	4	4
2839	321	1071	1	3	3
2836	680	971	2	7	3
2833	482	803	1	5	2
2835	297	743	1	3	2
2845	986	616	3	10	2
2831	484	538	1	5	2
2840	132	220	0	1	1
2830	82	165	0	1	1
2832	95	95	0	1	1
2841	55	61	0	1	1
2834					Disconnected
2837					Disconnected
2842					Disconnected
2844					Disconnected
2828					Disconnected

NDOT FSP LOAD RANK (continued)					
PLRM v2.1 Baseline Load Results					
Catchment	FSP (lbs/yr)	FSP (lb/yr/acre)	TP (lbs/yr)	TN (lbs/yr)	Rank
SR28-Atkins					
Atk2	2259	1738	6	19	5
Atk8	680	1133	2	5	3
Atk5	840	840	2	8	2
Atk10	737	819	2	8	2
Atk6	1268	793	4	11	2
Atk3	830	755	2	7	2
Atk7	297	330	1	3	1
Atk4	356	297	1	3	1
Atk1	560	280	2	5	1
Atk9	275	114	1	3	1
SR28_WC					
2824	1064	1064	3	11	3
2820	3872	1019	12	38	3
2823	848	942	3	9	3
2825	1174	903	4	12	3
2846	1304	767	5	13	2
2827	1456	728	4	15	2
2826	597	597	2	6	2
2852	29	143	0	0	1
SR28-MRtoLB					
2863	3289	1827	9	25	5
2814	2118	1765	6	18	5
2818	2099	1750	6	16	5
2809	2602	1735	7	19	5
2804	4199	1355	11	35	4
2805	1300	1083	4	11	3
2808	2606	1043	8	22	3
2815	1346	1035	4	12	3
2864	457	915	2	5	3
2850A	435	869	2	4	2
2850B	3763	836	11	31	2
2851					
2816	1894	728	8	19	2
2813	570	518	2	6	1

NDOT FSP LOAD RANK (continued)					
PLRM v2.1 Baseline Load Results					
Catchment	FSP (lbs/yr)	FSP (lb/yr/acre)	TP (lbs/yr)	TN (lbs/yr)	Rank
SR28-CBtoMR					
2810	1509	2155	4	12	5
2856	1718	2147	5	13	5
2821	3088	1930	8	21	5
2861	3742	1627	10	29	4
2855	2757	1622	7	23	4
2858	3896	1558	10	31	4
2853	558	1394	2	5	4
2854	692	1384	2	6	4
2857	684	1367	2	5	4
2860	1352	965	4	12	3
2859	611	255	2	5	1
SR431					
431010a	3325	8313	9	29	5
431009	4661	2219	12	36	5
431011	2163	2163	6	18	5
431018	1204	2006	3	10	5
431004	3689	1942	10	30	5
431050	4035	1921	11	34	5
431006b	763	1908	2	7	5
431007b	2394	1841	7	20	5
431010c	2706	1804	7	22	5
431003	1621	1801	4	13	5
431019	711	1777	2	6	5
431008	1057	1762	3	9	5
431020	1012	1686	3	8	4
431013	514	1284	1	4	4
431005	6551	963	18	55	3
431002	2560	776	7	26	2
431001	98	122	0	3	1
431006a					Disconnected
431007a					Disconnected
Totals	**205006**	**133159**	**564**	**1704**	
Credits	**1025**				

ATTACHEMENT A- OUTFALL CONNECTIVITY RAPID ASSESSMENT METHODOLOGY

Outfall Connectivity RAM

User's Guide

The purpose of the outfall connectivity rapid assessment methodology (OCRAM) is to provide a simple repeatable method to estimate the likelihood that stormwater would flow directly to Lake Tahoe or a perennial stream. The results of OCRAM will help rank connectivity of all outfalls and identify the most urgent treatment opportunities.

Procedures:

1. Locate the stormwater outfall. This could be simply a pipe discharge from a road right of way, but most outfalls usually include some flow dissipation feature such as rock or a small basin. The outfall is the location of the last man-made improvement in the flow path.
2. Measure the distance from the outfall to the receiving waterbody. This distance should follow the apparent flow path, not necessarily a straight line. When Lake Tahoe is the receiving water body, assume the lake is full to the rim. The rim-full assumption simplifies the connectivity analysis, provides consistent results from year to year, and represents a worst case connectivity scenario. Also, look for other outfalls that may contribute stormwater flows and complicate the analysis. As rules of thumb:
    a. If the distance from the outfall to the waterbody is less than 15 ft, assume the stormwater flow is directly connected to the waterbody.
    b. If the distance from the outfall to the waterbody is more than 500 ft, an initial assumption is the stormwater is not connected to the waterbody; however, this assumption should be confirmed with observations.
3. Measure the distance from the outfall to the last evidence of sediment deposition (or erosion). This distance should be the apparent flow path, not necessarily a straight line. Sediment deposition is often not contiguous and can be buried beneath vegetation, so a diligent effort to find stormwater-related sediment is suggested.
4. Use the equation below to generate a value that represents the degree of connectivity. Round the result to the nearest integer.

$$OCRAM = \frac{D_{deposition}}{D_{waterbody}} 5$$

Where: $D_{deposition}$ = distance to last evidence of sediment deposition (or erosion)

$D_{waterbody}$ = distance to receiving waterbody (assume lake is full)

5. Use the table below to translate the integer value into a relative text label.

Value	Text Label
0	Disconnected
1	Rarely connected
2	Occasionally connected
3	Partially connected
4	Mostly connected
5	Directly connected

6. Adjustments. There will be times when the above procedure does not fully represent the risk to the lake. For example, a flow path may be directed into an ephemeral channel reducing the ability for stormwater to infiltrate, increasing the pollutant risk to the lake. Or stormwater may enter a wetland that would help spread and treat the stormwater, reducing the risk to the lake. In these cases it is appropriate to adjust the final numeric value to reflect the qualitative assessment. However, in order to maintain some control and consistency over this subjective aspect of the RAM, values can only be adjusted ± 1.
7. Notes. A final section is provided for field notes. This allows the assessor to describe unique features of the outfall and other mitigating or exacerbating aspects.

Discussion

It is common knowledge that the ability of stormwater to move sediment or to erode soil is a function of many factors including the following:

- Slope

- Soil type

- Infiltration rate

- Antecedent moisture

- Volume and peak flow from the catchment draining to the outfall

- Sediment load

- Vegetation, rock, or other armoring of the flow path

- Complexity of the topography and storage in the flow path

All of the above factors can affect the distance sediment is transported from the outfall to the lake. By noting the evidence of furthest sediment deposition, all those factors above are integrated. However, this is a rapid assessment and not gospel. If other evidence does not agree with the RAM (like actual observations of stormwater flowing into the lake), then the additional evidence trumps the RAM.

Along this line, the RAM does not assess the connectivity for the 20 year 1 hour storm, unless such an event recently occurred. The OCRAM only assesses the connectivity for recent large events. But the relative connectivity assessment of one outfall compared to another should be the same. That is, the most connected outfall will still be the most connected for the 10 year 1 hour storm as it will be for the 20 year 1 hour storm. The OCRAM is a tool to help prioritize most urgent stormwater treatment opportunities.

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