

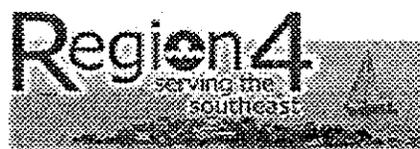
TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

For FECAL COLIFORM in the

STEKOA CREEK WATERSHED

(HUC 03060102)

Rabun County, Stekoa Creek, Georgia



APPROVAL PAGE
for FECAL COLIFORM in

Stekoa Creek, GA

Georgia's final 1998 303(d) list identified Stekoa Creek near Clayton, GA as not supporting its designated use, with the pollutant of concern being fecal coliform. This total maximum daily load (TMDL) is being established pursuant to the 1998 Georgia 303(d) list and the Consent Decree in the Georgia TMDL Lawsuit.

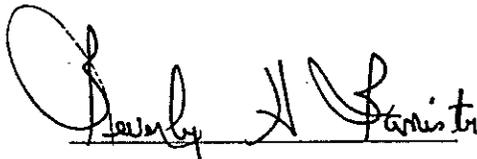
The background concentration of fecal coliform in Stekoa Creek is assumed to be 20 counts/100ml. This concentration is based on the background levels in other streams in the basin. The resulting load allocation for Stekoa Creek is 1.58×10^{10} counts/day.

The Total Maximum Daily Load for the Stekoa Creek segment between Clayton and the confluence with the Chattooga River for fecal coliform is given below:

Pollutant	TMDL (counts/day)	WLA (counts/day)	LA (counts/day)	MOS
Fecal Coliform	1.58×10^{10}	6.06×10^9	9.8×10^9	Implicit

The Fecal Coliform TMDL for the section of the Stekoa Creek segment between Clayton and the Chattooga River is 1.58×10^{10} counts/day.

APPROVED BY:



Robert F. McGhee, Director
Water Management Division
EPA-Region 4

3/7/00

Date

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Introduction

Section 303(d) of the Clean Water Act (CWA) as Amended by the Water Quality Act of 1987, Public Law 100-4, and the United States Environmental Protection Agency's (USEPA/EPA) Water Quality Planning and Management Regulations [Title 40 of the Code of Federal Regulation (40 CFR), Part 130] require each State to identify those waters within its boundaries not meeting water quality standards applicable to the waters' designated uses. Total maximum daily loads (TMDLs) for all pollutants violating or causing violation of applicable water quality standards are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality standards with consideration given to seasonal variations and margins of safety. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a water body, based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of their water resources (USEPA, 1991a).

Problem Definition

Georgia's final 1998 Section 303(d) list identified 14 miles of Stekoa Creek between Clayton and the confluence with the Chattooga River as not supporting its designated use as a fishing water, with the pollutant of concern being Fecal Coliform. This listing decision was based on limited historical data that was collected at water quality station 01002001.

The TMDL is being established pursuant to EPA commitments in the October 1997 Consent Decree in the Georgia TMDL lawsuit (*Sierra Club v. EPA & Hankinson*, 1998). These conditions include a requirement that TMDLs be proposed by August 30, 1999, for each water on the 1998 303(d) list that is impacted by a National Pollutant Discharge Elimination System (NPDES) permitted point source or point sources, and is located in the Savannah/Ogeechee Basins.

Target Identification

The target level for the development of the Fecal Coliform TMDL in the Stekoa Creek segment is the numeric criterion established in Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised July 6, 1999. The regulation establishes the freshwater criteria for Fecal Coliform expressed in terms of a geometric mean concentration of no more than 200 counts/100 ml for the months of May through October and 1,000 counts/100 ml for the months of November through April.

Background

The segment that is impaired is located directly downstream of the City of Clayton, Georgia. This 14-mile segment of Stekoa Creek is on the State of Georgia's §303 (d) list for violating the total Fecal Coliform standard for the State of Georgia. The State of Georgia collects water quality data on Stekoa Creek at Wolf Creek Road near Chechero, Georgia (please see Appendix A). A review of the limited data collected at this station indicates 16 violations during the months May 1990 through October 1997, and eight violations during the months November 1990 through April 1997.

The only point source on Stekoa Creek is the Clayton Water Pollution Control Plant (WPCP). In 1994, the City of Clayton began improvements to the WPCP facility to include dechlorination and sewer rehabilitation to reduce the number of sewer overflows. In 1996 the City of Clayton was placed under consent order No. EPD-WQ-3444 to complete the Clayton WPCP facility upgrade. In December 1997, the City of Clayton completed the facility upgrade.

Numeric Targets and Sources - Model Development

A steady-state water quality model provides predictions for only a single set of environmental conditions. For NPDES permitting purposes, steady-state models are applied for "critical" environmental conditions that represent conditions when the assimilative capacity of a waterbody is

very low. For discharges to riverine systems, critical environmental conditions correspond to drought upstream flows. The assumption behind steady-state modeling is that permit limits that protect water quality during critical conditions will be protective for the large majority of environmental conditions that occur. This TMDL does not consider the impacts of non-point source loadings of fecal coliforms due to wet weather events when the assimilative capacity of a waterbody is greater.

Critical Condition Determination

The most critical condition for this segment of Stekoa Creek will be used to determine the TMDL. Fecal Coliform will be considered a conservative substance in the TMDL calculation. The influence on the instream Fecal Coliform concentration will be river flow. For the Stekoa Creek segment, the critical flow will be considered 0.57 cubic meters per second. This flow represents the seven day low flow that occurs once every ten years (7Q10) on record for the Stekoa Creek, which is required by Georgia State law for regulated waters. The 7Q10 low flow characteristics of Stekoa Creek was obtained from BASINS, accessing the Reach File 1 meta information (USEPA, 1998).

Total Maximum Daily Load (TMDL)

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while achieving water quality standards. The components of the TMDL are the Wasteload Allocation (WLA) and the Load Allocation (LA) and the TMDL must take into consideration a Margin of Safety and seasonality. The WLA is the pollutant allocation to point sources while the LA is the pollutant allocation to natural background and nonpoint sources.

Margin of Safety

The margin of safety (MOS) is part of the TMDL development process. There are two basic methods for incorporating the MOS (USEPA, 1991a):

- Implicitly incorporating the MOS using conservative model assumptions to develop allocations,

or

- Explicitly specifying a portion of the total TMDL as the MOS; using the remainder for allocations.

The MOS is incorporated implicitly into this modeling process by selecting the critical low flow based on 20 years of flow data.

TMDL Calculation

The TMDL calculation will utilize the conservation of mass principle, where the load can be calculated by using the following relationship:

$$\text{Concentration} = \text{Load} / \text{Flow}$$

Rearranging this equation the maximum load can be calculated as follows:

$$\text{Load} = \text{Concentration (Water Quality Standard)} * \text{Flow}$$

The background concentration of fecal coliform in Stekoa Creek is assumed to be 20 counts/100ml.

This concentration is based on the background levels in other streams in the basin. The resulting load allocation for Stekoa Creek is 1.58×10^{10} counts/day.

The Total Maximum Daily Load for the Stekoa Creek segment between Clayton and the confluence with the Chattooga River for fecal coliform is given in Table 1.

Table 1. TMDL Calculation and Waste Load Allocation

Pollutant	TMDL (counts/day)	WLA (counts/day)	LA (counts/day)	MOS
Fecal Coliform	1.58×10^{10}	6.06×10^9	9.8×10^9	Implicit

The Fecal Coliform TMDL for the section of the Stekoa Creek segment between Clayton and Chattooga River is 1.58×10^{10} counts/day.

Seasonal Variation

The low flow condition represents the most critical design condition and will provide year round protection. For example at the long term mean flow of 2.41 cms the maximum daily load of fecal coliform concentration would be 4.14×10^{11} counts/day. This concentration is about 76 % higher than the TMDL.

Allocation of Responsibility and Recommendations

The allocation for Fecal Coliform to this segment of Stekoa Creek is given in Table 1. For a potential future point or nonpoint source of Fecal Coliform loadings introduced into the system, the total of the WLA (wasteload allocations for point source loadings) and LA (load allocation for nonpoint source loadings) shall not exceed this TMDL.

References:

USEPA. 1991a. *Guidance for Water Quality-based Decisions: The TMDL Process*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-440/4-91-001, April 1991.

USEPA. 1998. *Better Assessment Science Integrating Point and Nonpoint Sources, BASINS, Version 2.0 User's Manual*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-823-B-98-006, November 1998.

Georgia Department of Natural Resources, Environmental Protection Division. 1998. *Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03, Water Use Classifications and Water Quality Standards*, July 1999.

Sierra Club v. EPA & Hankinson. 1998. USDC-ND-GA Atlanta Div. #1: 94-CV-2501-MHS.

Appendix A: Water Quality Data at Station 01002001

01002001 02177450
 STORET System
 34 50 07.0 083 20 49.0 2
 STEKOA CREEK - WOLF CREEK ROAD NEAR CHECHERO
 13241 GEORGIA RABUN
 SOUTHEAST 031300
 SAVANNAH
 21GAEPD 03060102 /TYPA/AMBNT/STREAM
 900707 DEPTH 0

INDEX

MILES

31615

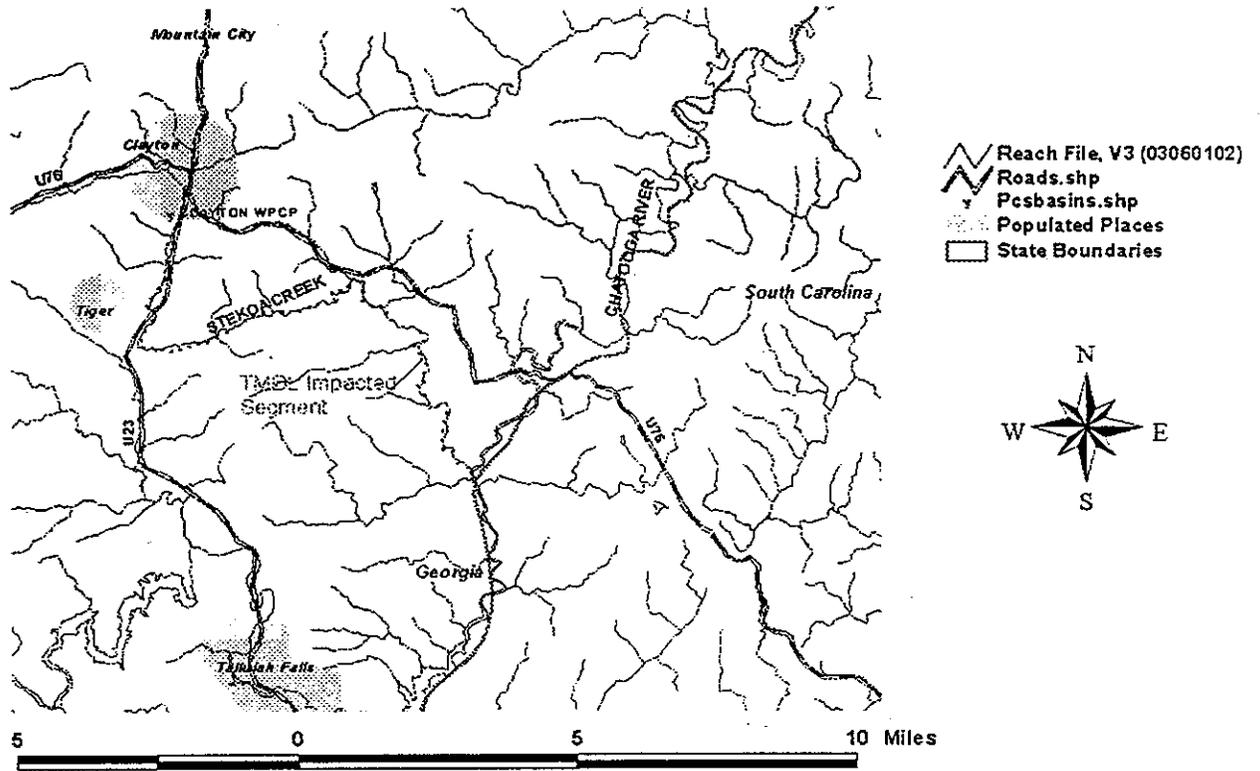
DATE TIME DEPTH FEC COLI
 FROM OF MPNECMED
 TO DAY FEET /100ML

90/07/19 1250	0	11000
90/09/13 1250	0	54000
90/11/13 1230	0	1300
91/01/17 1310	0	260
91/03/14 0715	0	330
91/05/16 1000	0	35000
91/08/15 1140	0	1100
91/10/09 1250	0	790
91/12/10 0800	0	3300
92/02/11 0715	0	700
92/04/14 0540	0	1700
92/06/09 0855	0	3300
92/08/11 0550	0	3300
92/10/13 0545	0	1100
92/12/08 0640	0	1300
93/02/09 0615	0	1700
93/04/13 0545	0	895
93/06/08 0600	0	3300
93/08/10 0530	0	790
93/10/12 0530	0	4900
93/12/14 0630	0	330
94/02/08 0630	0	2200
97/01/22 1715	0	315
97/02/17 1545	0	20
97/03/13 1150	0	220
97/04/10 1645	0	80
97/05/15 1400	0	80
97/06/12 1600	0	54000
97/07/17 1415	0	3300
97/08/14 1425	0	700
97/09/11 1715	0	3300

97/10/30	1625	0	460
97/11/13	1135	0	2300
97/12/04	1045	0	3300

Appendix B: Location Map

Stekoa Creek TMDL Location Map



Appendix C: Units Conversion Table

From	To	Multiply by:
Million Gallons per Day (MGD)	Cubic Meters per Second (cms)	0.04381
Cubic Feet per Second (cfs)	Cubic Meters per Second (cms)	0.02832
Pounds (lbs)	Kilograms (Kg)	0.4536
Tons (Short)	Kilograms (Kg)	907.1848
Tons (Long)	Kilograms (Kg)	1016.00

Administrative Record Index

1. Clayton, Georgia, Water Pollution Control Plant NPDES Permit No. GA0020923.
2. Compilation of Georgia's Current Modeling Guidelines for the Development of Wasteload Allocations and NPDES Permit Limitations. January 1991
3. Georgia Department of Natural Resources, Environmental Protection Division, Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03, Water Use Classifications and Water Quality Standards
4. BASINS GIS data base for 7Q10 and mean flows for Stekoa Creek.
5. Shivalingaiah, B. and James, W. (June 1984) Algorithms for buildup washoff and routing pollutants in urban runoff., Proceedings of 3rd International Conference on Urban Storm Drainage, Goteborg Sweden, pp. 1445-1456., Reference No. I3147
6. STORET Water Quality Data
7. Stored on TMDL Shared drive m:/apps32/tmdl/stekoa STORET Water Quality Data
8. Stored on TMDL Shared drive m:/apps32/tmdl/stekoa Excel Spreadsheet to calculate fecal coliform concentration
9. Stored on TMDL Shared drive m:/apps32/tmdl/stekoa

Response to Public Comment on Proposed TMDL

COMMENT

The TMDL should be done for the entire segment of Stekoa Creek and not just downstream of Clayton.

Mr. Eric E. Huber, EarthJustice Legal Defense Fund, 400 Magazine Street, Suite 401, New Orleans, Louisiana 70130-2453, December 7, 1999

RESPONSE

The TMDL is for the impaired segment of Stekoa Creek as shown on the 303(d) list. The comment concerns a § 303(d) listing issue and is not directly relevant to the matter of the public opportunity for comment on numerous proposed TMDLs for waters and pollutants in the State of Georgia.

It is recommended that the commenter provide his written comments, along with supporting data and information, to the Georgia EPD for consideration in the development of its 2000 § 303(d) list.

COMMENT

It is not clear what the limits of the Clayton facility are or whether they are consistent with the wasteload allocation of the TMDL. If not, they need to be revised accordingly.

Mr. Eric E. Huber, EarthJustice Legal Defense Fund, 400 Magazine Street, Suite 401, New Orleans, Louisiana 70130-2453, December 7, 1999

RESPONSE

The Clayton WPCP facility recently upgraded the facility to include dechlorinization. The facility meets end-of-pipe criteria for fecal coliform bacteria.

COMMENT

The TMDLs were calculated using mass balance techniques. Commenters do not believe that the mass balance technique addresses the complexity of the sampling and potential elevated background loading associated with fecal coliform.

Mr. Michael E. Wilder, Water Resources Workgroup Chair, and Mr. James R. Baker, Chair, Georgia Industry Environmental Coalition, 112 Town Park Drive, Kennesaw, Georgia 30144, December 14, 1999

RESPONSE

Comment noted.

COMMENT

The flows and concentrations for the City of Clayton and City of Toccoa, respectively, were not provided.

Mr. Michael E. Wilder, Water Resources Workgroup Chair, and Mr. James R. Baker, Chair, Georgia Industry Environmental Coalition, 112 Town Park Drive, Kennesaw, Georgia 30144, December 14, 1999

RESPONSE

During the development of the TMDL, attempts were made to retrieve this data from GAEPD but it was not provided. The City of Toccoa WPCP facility is not in the Stekoa Creek watershed.

COMMENT

The low flow scenario is not the only water quality limited situation for this water. It is not legally or technically acceptable for a TMDL to fail to address all pertinent critical flow scenarios. Failure to address high flow scenarios at this time will allow the most serious fecal problems to go unaddressed for a long time.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

This TMDL was used to evaluate the potential impacts of NPDES permitted facilities on water quality as agreed upon in the Georgia TMDL Lawsuit Consent Decree. The low flow scenario represents critical conditions. Load allocations established for this period will provide an added margin of safety during high flow scenarios.

COMMENT

EPA needs to justify its intention to set a TMDL at low flow and to use that as a margin of safety. There must be some accounting of nonpoint loads of fecal. The evident desire of EPA to split fecal into two separate TMDLs in order to address high flow TMDL considerations at a later time is not an appropriate approach and it fails to adequately address the required seasonal variation component of a TMDL.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

This TMDL was used to evaluate the potential impacts of NPDES permitted facilities on water quality as agreed upon in the Georgia TMDL Lawsuit Consent. Insufficient data are collected on Stekoa Creek for wet weather analysis. The margin of safety incorporated in the TMDL includes a background concentration of fecal coliform bacteria of 20 counts/100ml.

COMMENT

Fecal problems occur mostly at higher flows from nonpoint sources, from sewer leaks/overflows, as well as from some permitted discharges. A standard protocol is needed for addressing typical fecal TMDLs where site specific models are not available.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

This TMDL was used to evaluate the potential impacts of NPDES permitted facilities on water quality as agreed upon in the Georgia TMDL Lawsuit Consent Decree. Insufficient

data are available for wet weather analysis. In general, geometric mean fecal coliform concentrations are higher in the summer dry months than corresponding annual or winter wet weather geometric mean concentrations. This is due to a rate of dilution by high, wet weather discharge that exceeds the subsequent increase in fecal coliform loading.

COMMENT

EPA guidance requires that, where nonpoint sources cannot be reduced through enforceable controls, the reduction burden must be placed on permitted sources. The TMDL has applied the standard to the end of the pipe with an expectation that any necessary reductions would come from unregulated, uncontrolled, or unknown nonpoint sources. In the TMDL, the WLA for the point sources should be established at a lower level than the in-stream standard before there can be any contention that EPA has incorporated any MOS. This is especially true because the TMDL only addresses the low flow situation where there would be zero MOS.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

This TMDL was used to evaluate the potential impacts of NPDES permitted facilities on water quality as agreed upon in the Georgia TMDL Lawsuit Consent Decree. Insufficient data are available for wet weather analysis. In general, geometric mean fecal coliform concentrations are higher in the summer dry months than corresponding annual or winter wet weather geometric mean concentrations. This is due to a rate of dilution by high, wet weather discharge that exceeds the subsequent increase in fecal coliform loading. The margin of safety includes a background concentration of 20 counts/100 ml.

COMMENT

The TMDL addresses only the single criterion of 200/100 ml geometric mean. There are other criterion in the regulations. If EPA contends that its reference to the single criterion is sufficient to address all other regulatory standards, this needs to be stated, explained, and supported.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The TMDL based on the single criterion of 200 counts/100ml reflects critical conditions. Using this approach the TMDL provides reasonable assurance that other water quality standards can be met under various flow conditions.

COMMENT

This stream would likely be used for recreation because it is located in the mountains. The use designation should reflect this.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

Georgia EPD is responsible for determining the designated use of streams. It is recommended that the commenter provide his written comments, along with supporting data and information, to the Georgia EPD.

COMMENT

The § 303(d) list includes urban runoff as the problem, but there's very little "urban" shown on a map of the area.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The comment concerns a § 303(d) listing issue and is not directly relevant to the matter of the public opportunity for comment on numerous proposed TMDLs for waters and pollutants in the State of Georgia.

It is recommended that the commenter provide his written comments, along with supporting data and information, to the Georgia EPD for consideration in the development of its 2000 § 303(d) list.

COMMENT

Are there any data since the upgrade in 1997 to see if there is still a problem?

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

The final TMDL report has been modified to include fecal coliform data collected on Stekoa Creek. The data are from STORET and includes data collected from July 1990 through December 1997. Data collected after this period were not available and it was not possible to determine the impact of the upgrade on water quality in Stekoa Creek.

COMMENT

On page 2, it is stated that "this TMDL does not consider the impacts...due to wet weather events", but that is precisely the stated problem - sewer overflows. This TMDL misses the point.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street, Athens, Georgia 30601, December 22, 1999

RESPONSE

This TMDL was used to evaluate the potential impacts of NPDES permitted facilities on water quality as agreed upon in the Georgia TMDL Lawsuit Consent Decree. Insufficient data are available for wet weather analysis. In general, geometric mean fecal coliform concentrations are higher in the summer dry months than corresponding annual or winter wet weather geometric mean concentrations. This is due to a rate of dilution by high, wet weather discharge that exceeds the subsequent increase in fecal coliform loading.

COMMENT

The 7Q10 given by BASINS seems way too high. The water looks like a smaller stream on the map. This and all similar information needs to be verified.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street,
Athens, Georgia 30601, December 22, 1999

RESPONSE

Comment noted.

COMMENT

The units in the headings of Table 1 change from counts/day to kg/day. This is a typo or it needs to be explained. Above the table, it is stated that the load allocation for Stekoa Creek is 1.58×10^{10} , but no units are given.

Mr. Douglas P. Haines, Executive Director, Georgia Legal Watch, 264 North Jackson Street,
Athens, Georgia 30601, December 22, 1999

RESPONSE

The individual components of the TMDL are expressed in units of counts/day. The text in the final TMDL report has been changed accordingly.