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Suggested edits
from TNC.

David Hamilton

DRAFT 4

SUBSTITUTE FOR

HOUSE BILL NO. 5638

A bill to amend 1994 PA 451, entitled
"Natural resources and environmental protection act,"
by amending section 32706c (MCL 324.32706c), as added by 2008 PA
181.

THE PEOPLE OF THE STATE OF MICHIGAN ENACT:

1 Sec. 32706c. (1) If the assessment tool determines that a
2 proposed withdrawal **WITH A CAPACITY OF 1,000,000 GALLONS OF WATER**
3 **OR LESS PER DAY FROM THE WATERS OF THE STATE TO SUPPLY A COMMON**
4 **DISTRIBUTION SYSTEM** is ~~a zone B withdrawal in a cold-transitional~~
5 ~~river system, or~~ a zone C or zone D withdrawal, the property owner
6 shall ~~MAY~~ submit to the department a ~~THE INFORMATION DESCRIBED IN~~
7 ~~SECTION 32706A(3)~~ ^{32706C(4)} AND EITHER OF THE FOLLOWING:

8 (A) AN ANALYSIS OF THE PROPOSED WITHDRAWAL BY A PROFESSIONAL



CALCULATING THE
2 STREAMFLOW DEPLETION OF

1 HYDROLOGIST OR HYDROGEOLOGIST, DEMONSTRATING THE PROPOSED WITHDRAWAL
2 IS NOT LIKELY TO CAUSE AN ADVERSE RESOURCE IMPACT. THE ANALYSIS
3 SHALL BE BASED ON AN AQUIFER PERFORMANCE TEST, STREAMFLOW DEPLETION
4 CALCULATIONS, AND GEOLOGICAL DATA CONSISTING OF AT LEAST 1 OF THE
5 FOLLOWING, WHICH SHALL BE INCLUDED WITH THE ANALYSIS:

6 (i) EVIDENCE THE PROPOSED WITHDRAWAL IS IN THE WATER
7 MANAGEMENT UNIT OR UNITS THAT WERE PART OF A REGIONAL OR WATERSHED
8 BASED STUDY OF WATER USE IMPACTS ACCEPTED BY THE DEPARTMENT UNDER
9 THIS SECTION OR SECTION 32706D. THE EVIDENCE MUST INCLUDE AN
10 AFFIDAVIT BY THE PROPERTY OWNER THAT THE PROPOSED WITHDRAWAL IS
11 LOCATED IN A RIVER SYSTEM AND AQUIFER INCLUDED IN THE STUDY, AND
12 RECORDS OF APPLICABLE DATA COLLECTED IN THE STUDY.

13 (ii) A HYDROGEOLOGIC ANALYSIS OF THE WATER MANAGEMENT UNIT OR
14 UNITS THAT WILL POTENTIALLY BE AFFECTED BY THE PROPOSED WITHDRAWAL,
15 INCORPORATING DATA FROM WELL LOGS, GAMMA RAY LOGS, SURFICIAL MAPS
16 OF THE GLACIAL GEOLOGY, GEOLOGIC CROSS SECTIONS, AND ANY OTHER
17 AVAILABLE HYDROGEOLOGIC DATA.

18 (B) REGISTRATION FOR A PROPOSED WITHDRAWAL THAT WILL DRAW
19 WATER FROM AQUIFERS SEPARATED FROM GLACIAL AQUIFERS BY BEDROCK.

20 (2) WITHIN 10 WORKING DAYS AFTER THE DEPARTMENT'S ACTUAL
21 RECEIPT OF THE ANALYSES AND SUPPORTING EVIDENCE AND DATA RELATED TO
22 THE PROPOSED WITHDRAWAL UNDER SUBSECTION (1), THE DEPARTMENT SHALL
23 DETERMINE WHETHER A PROPOSED WITHDRAWAL IS A ZONE A, ZONE B, ZONE
24 C, OR ZONE D WITHDRAWAL AND SHALL PROVIDE TO THE PROPERTY OWNER
25 WRITTEN NOTIFICATION OF ITS DETERMINATION. THE DEPARTMENT'S
26 DETERMINATION IS SUBJECT TO THE FOLLOWING:

27 (A) IF THE DEPARTMENT FAILS TO PROVIDE WRITTEN NOTIFICATION TO



1 THE PROPERTY OWNER WITHIN 10 WORKING DAYS AFTER THE ACTUAL RECEIPT
2 OF THE ANALYSES AND SUPPORTING EVIDENCE AND DATA, THE PROPERTY
3 OWNER MAY REGISTER THE WITHDRAWAL AND PROCEED WITH THE WITHDRAWAL.

4 (B) IF THE DEPARTMENT DETERMINES THAT THE PROPOSED WITHDRAWAL
5 IS A ZONE A OR A ZONE B WITHDRAWAL, THE PROPERTY OWNER MAY REGISTER
6 THE WITHDRAWAL AND MAY PROCEED WITH THE WITHDRAWAL.

7 (C) IF THE DEPARTMENT DETERMINES THAT THE PROPOSED WITHDRAWAL
8 IS A ZONE C WITHDRAWAL, THE PROPERTY OWNER MAY REGISTER THE
9 WITHDRAWAL AND PROCEED TO MAKE THE WITHDRAWAL IF THE PROPERTY OWNER
10 SELF-CERTIFIES THAT HE OR SHE IS IMPLEMENTING APPLICABLE
11 ENVIRONMENTALLY SOUND AND ECONOMICALLY FEASIBLE WATER CONSERVATION
12 MEASURES PREPARED UNDER SECTION 32708A THAT THE PROPERTY OWNER
13 CONSIDERS TO BE REASONABLE OR HAS SELF-CERTIFIED THAT HE OR SHE IS
14 IMPLEMENTING APPLICABLE ENVIRONMENTALLY SOUND AND ECONOMICALLY
15 FEASIBLE WATER CONSERVATION MEASURES DEVELOPED FOR THE WATER USE
16 ASSOCIATED WITH THAT SPECIFIC WITHDRAWAL THAT THE PROPERTY OWNER
17 CONSIDERS TO BE REASONABLE. A PROPERTY OWNER PROCEEDING UNDER THIS
18 SUBDIVISION SHALL PROVIDE 5 SETS OF WATER LEVEL RECOVERY
19 MEASUREMENTS, AS DESCRIBED IN AN AQUIFER PERFORMANCE TEST, TAKEN
20 AFTER PUMPING BETWEEN JUNE AND OCTOBER WITHIN 2 YEARS AFTER THE
21 PRODUCTION WELL IS PUT IN SERVICE. THE DEPARTMENT SHALL NOT REQUIRE
22 SUBMISSION OF ADDITIONAL INFORMATION OR DATA FROM A PROPERTY OWNER
23 PROCEEDING UNDER THIS SUBDIVISION.

24 (D) IF THE DEPARTMENT DETERMINES THAT THE PROPOSED WITHDRAWAL
25 IS A ZONE D WITHDRAWAL, THE PROPERTY OWNER SHALL NOT REGISTER THE
26 WITHDRAWAL AND SHALL NOT MAKE THE WITHDRAWAL UNLESS THE PROPERTY
27 OWNER APPLIES FOR A WATER WITHDRAWAL PERMIT UNDER SECTION 32723 AND



1 THE WITHDRAWAL IS AUTHORIZED UNDER THAT SECTION, OR UNLESS IT IS
2 AUTHORIZED UNDER SUBSECTION (4). IN ADDITION TO THE WRITTEN
3 NOTIFICATION OF ITS DETERMINATION UNDER THIS SUBSECTION, IF THE
4 DEPARTMENT DETERMINES THAT THE PROPOSED WITHDRAWAL IS A ZONE D
5 WITHDRAWAL, THE DEPARTMENT SHALL INCLUDE DOCUMENTATION
6 DEMONSTRATING THAT THE PROPOSED WATER WITHDRAWAL IS LIKELY TO CAUSE
7 AN ADVERSE RESOURCE IMPACT. THE DOCUMENTATION SHALL INCLUDE 1 OR
8 MORE OF THE FOLLOWING:

9 (i) IDENTIFICATION OF SPECIFIC ERRORS IN DATA COLLECTION
10 PERFORMED BY THE PROFESSIONAL HYDROLOGIST OR HYDROGEOLOGIST THAT
11 RENDER THE ANALYSIS OF THE PROPOSED WITHDRAWAL INVALID.

12 (ii) A STATEMENT THAT THE PROFESSIONAL HYDROLOGIST OR
13 HYDROGEOLOGIST USED AN INAPPLICABLE MODEL TO ANALYZE THE PROPOSED
14 WITHDRAWAL, WITH AN EXPLANATION INCLUDING BOTH WHY THE MODEL
15 SELECTED FOR ANALYSIS WAS INAPPLICABLE FOR THE PROPOSED WITHDRAWAL
16 AND AN ANALYSIS USING AN APPLICABLE MODEL THAT SHOWS THE PROPOSED
17 WITHDRAWAL IS LIKELY TO CAUSE AN ADVERSE RESOURCE IMPACT.

18 (iii) IDENTIFICATION OF SPECIFIC ERRORS IN THE MODEL ANALYSIS
19 PERFORMED BY THE PROFESSIONAL HYDROLOGIST OR HYDROGEOLOGIST THAT
20 RENDER THE ANALYSIS OF THE PROPOSED WITHDRAWAL INVALID.

21 (iv) THE CUMULATIVE STREAMFLOW DEPLETION ESTIMATED FOR ALL THE
22 REGISTERED WATER WITHDRAWALS IN AN IMPACTED WATERSHED MANAGEMENT
23 AREA IS LIKELY TO CAUSE AN ADVERSE RESOURCE IMPACT. ~~THE CUMULATIVE~~
24 ~~STREAMFLOW DEPLETION CALCULATION SHALL ACCOUNT FOR REEVALUATION OF~~
25 ~~PREVIOUSLY REGISTERED WATER WITHDRAWALS IN THE AFFECTED WATER~~
26 ~~MANAGEMENT UNITS USING THE HUNT, 2003; WARD AND LOUGH, 2011; OR A~~
27 ~~SIMILAR PEER-REVIEWED MODEL THAT ASSESSES POTENTIAL STREAM~~



1 **DEPLETION.**

2 (3) AFTER A PROPERTY OWNER REGISTERS A WITHDRAWAL PURSUANT TO
 3 SUBSECTION (2), IF, IN DEVELOPING THE CAPACITY TO MAKE THE
 4 WITHDRAWAL, THE CONDITIONS OF THE WITHDRAWAL DEVIATE FROM THE
 5 SPECIFIC DATA THAT WERE EVALUATED, THE PROPERTY OWNER SHALL NOTIFY
 6 THE DEPARTMENT OF THE CORRECTED DATA AND THE DEPARTMENT SHALL
 7 CONFIRM ITS DETERMINATION UNDER SUBSECTION (2). IF THE CORRECTED
 8 DATA DO NOT CHANGE THE DETERMINATION, THE PROPERTY OWNER MAY
 9 PROCEED WITH THE WITHDRAWAL. IF THE CORRECTED DATA CHANGE THE
 10 DETERMINATION, THE PROPERTY OWNER SHALL PROCEED UNDER THE
 11 PROVISIONS OF THIS PART RELATED TO THE CORRECTED DETERMINATION.

12 (4) IF A PROPOSED WITHDRAWAL IS A ZONE B WITHDRAWAL IN A COLD-
 13 TRANSITIONAL RIVER SYSTEM, OR A ZONE C OR ZONE D WITHDRAWAL, AND A
 14 PROPERTY OWNER DOES NOT SUBMIT ANY OF THE INFORMATION DESCRIBED IN
 15 SUBSECTION (1) OR THE DEPARTMENT DETERMINES UNDER SUBSECTION (2)
 16 THAT THE PROPOSED WITHDRAWAL IS A ZONE D WITHDRAWAL, ^{OR A ZONE B WITHDRAWAL IN A COLD-TRANSITIONAL RIVER SYSTEM} THE PROPERTY
 17 OWNER MAY request for a site-specific review. Additionally, if the
 18 ~~assessment tool determines that a proposed withdrawal is a zone A~~
 19 ~~withdrawal, or a zone B withdrawal in a cool river system or a warm~~
 20 ~~river system and the property owner wishes to have a site specific~~
 21 ~~review, the property owner may submit to the department a request~~
 22 ~~for a site specific review. A request for a site-specific review~~
 23 ~~shall be submitted to the department in a form required by the~~
 24 ~~department and shall include all of the following:~~

25 (a) The information described in section 32706a(3).

26 (b) The intended maximum monthly and annual volumes and rates
 27 of the proposed withdrawal, if different from the capacity of the



1 equipment used for making the proposed withdrawal.

2 (c) If the amount and rate of the proposed withdrawal will
3 have seasonal fluctuations, the relevant information related to the
4 seasonal use of the proposed withdrawal.

5 (d) A description of how the water will be used and the
6 location, amount, and rate of any return flow.

7 (e) Any other information the property owner would like the
8 department to consider in making its determination under this
9 section.

10 (5) ~~(2)~~ Upon receipt of a request for a site-specific review
11 **UNDER SUBSECTION (4)**, the department shall consider the information
12 submitted ~~to the department under subsection (1)~~ and shall consider
13 the actual stream or river flow data of any affected stream reach.
14 The department shall also apply the drainage area ~~aggregation~~
15 **INTEGRATION** standards provided in section 32706a(2)(a), (b), and
16 (c), if applicable, and account for cumulative withdrawals as
17 provided for in section 32706e. The department shall not rely on
18 the assessment tool's determination in making its determination
19 under a site-specific review. **THE DEPARTMENT MAY CALCULATE**
20 **STREAMFLOW DEPLETION USING HUNT, 2003; WARD AND LOUGH, 2011; OR A**
21 **SIMILAR PEER-REVIEWED** ^{AN APPROPRIATE} **MODEL THAT ASSESSES POTENTIAL STREAM**
22 **DEPLETION. THE CALCULATION OF STREAMFLOW DEPLETION MAY ALSO BE**
23 **CONDUCTED ON EXISTING WITHDRAWALS IN THE SAME WATER MANAGEMENT UNIT**
24 **OR UNITS AS THE PROPOSED WITHDRAWAL IF APPLICABLE DATA IS**
25 **AVAILABLE. THIS DATA MAY BE USED TO PROVIDE ADDITIONAL EVIDENCE AS**
26 **NEEDED TO DEMONSTRATE WHETHER A PROPOSED WITHDRAWAL IS LIKELY TO**
27 **CAUSE AN ADVERSE RESOURCE IMPACT.**



1 (6) ~~(3)~~—The department shall complete ~~its~~ ~~A~~ site-specific
2 review within 10 working days of submittal of a request for a site-
3 specific review. If the department determines, based upon a site-
4 specific review, that the proposed withdrawal is a zone A or a zone
5 B withdrawal, the department shall provide written notification to
6 the property owner and the property owner may register the
7 withdrawal and may proceed with the withdrawal.

8 (7) ~~(4)~~—Subject to subsection ~~(5)~~, ~~(8)~~, if the department
9 determines in conducting a site-specific review that the proposed
10 withdrawal is a zone C withdrawal, the property owner may register
11 the withdrawal and proceed to make the withdrawal if the property
12 owner self-certifies that he or she is implementing applicable
13 environmentally sound and economically feasible water conservation
14 measures prepared under section 32708a that the property owner
15 considers to be reasonable or has self-certified that he or she is
16 implementing applicable environmentally sound and economically
17 feasible water conservation measures developed for the water use
18 associated with that specific withdrawal that the property owner
19 considers to be reasonable.

20 (8) ~~(5)~~—Except for withdrawals exempt from obtaining a water
21 withdrawal permit under section 32723, if a site-specific review
22 determines that a proposed withdrawal is a zone C withdrawal with
23 capacity in excess of 1,000,000 gallons of water per day from the
24 waters of the state to supply a common distribution system, the
25 person proposing the withdrawal shall not register the withdrawal
26 and shall not proceed with making the withdrawal unless the person
27 obtains a water withdrawal permit under section 32723.



1 (9) ~~(6)~~—If the department determines, based upon a site-
2 specific review, that the proposed withdrawal is a zone D
3 withdrawal, the property owner shall not register the withdrawal
4 and shall not make the withdrawal unless he or she applies for a
5 water withdrawal permit under section 32723 and the withdrawal is
6 authorized under that section.

7 (10) ~~(7)~~—After a property owner registers a withdrawal
8 following a site-specific review, if, in developing the capacity to
9 make the withdrawal, the conditions of the withdrawal deviate from
10 the specific data that were evaluated in the site-specific review,
11 the property owner shall notify the department of the corrected
12 data and the department shall confirm its determination under the
13 site-specific review. If the corrected data do not change the
14 determination under the site-specific review, the property owner
15 may proceed with the withdrawal. If the corrected data change the
16 determination under the site-specific review, the property owner
17 shall proceed under the provisions of this part related to the
18 corrected determination.

19 ~~(8) Subject to subsection (9), prior to the implementation~~
20 ~~date of the assessment tool under section 32706a, a property owner~~
21 ~~proposing to develop withdrawal capacity on his or her property to~~
22 ~~make a new or increased large quantity withdrawal may submit to the~~
23 ~~department a request for an interim site specific review under this~~
24 ~~subsection to determine whether or not the proposed withdrawal is~~
25 ~~likely to cause an adverse resource impact. The department, upon~~
26 ~~request, shall conduct an interim site specific review under this~~
27 ~~subsection within a reasonable time period not to exceed 30 days~~



1 ~~based upon an evaluation of reasonably available information. For~~
 2 ~~purposes of this part, a determination under an interim site-~~
 3 ~~specific review under this subsection shall be afforded the same~~
 4 ~~status as a site-specific review otherwise conducted under this~~
 5 ~~section.~~

6 ~~(9) Except for withdrawals exempt from obtaining a permit~~
 7 ~~under section 32723, a property owner who, prior to the~~
 8 ~~implementation of the assessment tool under section 32706a, intends~~
 9 ~~to develop withdrawal capacity on his or her property to make a new~~
 10 ~~or increased large quantity withdrawal of more than 1,000,000~~
 11 ~~gallons of water per day from the waters of the state to supply a~~
 12 ~~common distribution system shall obtain an interim site specific~~
 13 ~~review under subsection (8). If the interim site specific review~~
 14 ~~determines that the proposed withdrawal is a zone C withdrawal, the~~
 15 ~~property owner shall not proceed with making the withdrawal unless~~
 16 ~~the person obtains a water withdrawal permit under section 32723.~~

17 **(11) AS USED IN THIS PART:**

18 **(A) "AQUIFER PERFORMANCE TEST" MEANS A CONTROLLED FIELD TEST**
 19 **IN WHICH ALL OF THE FOLLOWING ARE DONE:**

20 **(i) AT LEAST 1 MONITORING WELL IS INSTALLED. THE MONITORING**
 21 **WELL MUST BE INSTALLED IN THE SAME AQUIFER AND SCREENED AT OR NEAR**
 22 **THE SAME DEPTH AS THE PRODUCTION WELL, AND BE LOCATED AT A DISTANCE**
 23 **OF 1 TO 5 TIMES THE THICKNESS OF THE AQUIFER FROM THE PROPOSED**
 24 **PRODUCTION WELL. A NEARBY EXISTING WELL MAY BE USED AS A MONITORING**
 25 **WELL FOR THE TEST INSTEAD IF IT MEETS ALL THE MONITORING WELL**
 26 **REQUIREMENTS.**

27 **(ii) STATIC WATER LEVEL ELEVATION MEASUREMENTS ARE TAKEN AT 1-**



1 MINUTE INTERVALS FOR 24 HOURS BEFORE THE PUMPING PORTION OF THE
2 TEST TO AN ACCURACY OF 0.05 FEET.

3 (iii) PUMPING IS CONDUCTED AT A RATE AT OR ABOVE THE DESIRED
4 PRODUCTION RATE FOR THE DURATION OF THE TEST AND METERED OR
5 PERIODICALLY MEASURED TO ENSURE CONSISTENCY OF RATE.

6 (iv) THE PUMPING PORTION OF THE TEST IS CONDUCTED FOR A PERIOD
7 OF 24 HOURS IN CONFINED AQUIFERS OR 72 HOURS IN UNCONFINED
8 AQUIFERS, DURING WHICH DRAWDOWN MEASUREMENTS ARE TAKEN AT 1-MINUTE
9 INTERVALS TO AN ACCURACY OF 0.05 FEET.

10 (v) AFTER COMPLETION OF THE PUMPING PERIOD, MEASUREMENTS OF
11 WATER LEVEL RECOVERY ARE TAKEN AT 1-MINUTE INTERVALS FOR 24 HOURS
12 TO AN ACCURACY OF 0.05 FEET.

13 (vi) AN ANALYSIS IS CONDUCTED TO DETERMINE, AT A MINIMUM, THE
14 AQUIFER HYDRAULIC CHARACTERISTICS OF TRANSMISSIVITY AND STORAGE
15 COEFFICIENT EMPLOYING THE METHODS OF COOPER AND JACOB, 1946; THEIS,
16 1935; HANTUSH AND JACOB, 1955; HANTUSH AND JACOB, 1960; HANTUSH AND
17 JACOB, 1961; NEUMAN, 1972; NEUMAN, 1974; OR HUNT AND SCOTT, 2007.

18 (B) "COOPER AND JACOB, 1946" MEANS COOPER AND JACOB, 1946: "A
19 GENERALIZED GRAPHICAL METHOD FOR EVALUATING FORMATION CONSTANTS AND
20 SUMMARIZING WELL-FIELD HISTORY".

21 (C) "HANTUSH AND JACOB, 1955" MEANS HANTUSH AND JACOB, 1955:
22 "NON-STEADY RADIAL FLOW IN AN INFINITE LEAKY AQUIFER".

23 (D) "HANTUSH AND JACOB, 1960" MEANS HANTUSH AND JACOB, 1960:
24 "MODIFICATION OF THE THEORY OF LEAKY AQUIFERS".

25 (E) "HANTUSH AND JACOB, 1961" MEANS HANTUSH AND JACOB, 1961:
26 "AQUIFER TESTS ON PARTIALLY PENETRATING WELLS".

27 (F) "HUNT, 1999" MEANS HUNT, 1999: "UNSTEADY STREAM DEPLETION



1 FROM GROUND WATER PUMPING".

2 (G) "HUNT, 2003" MEANS HUNT, 2003: "UNSTEADY STREAM DEPLETION
3 WHEN PUMPING FROM SEMICONFINED AQUIFER".

4 (H) "HUNT AND SCOTT, 2007" MEANS HUNT AND SCOTT, 2007: "FLOW
5 TO A WELL IN A TWO-AQUIFER SYSTEM".

6 (I) "NEUMAN, 1972" MEANS NEUMAN, 1972: "THEORY OF FLOW IN
7 UNCONFINED AQUIFERS CONSIDERING DELAYED GRAVITY RESPONSE OF THE
8 WATER TABLE".

9 (J) "NEUMAN, 1974" MEANS NEUMAN, 1974: "EFFECT OF PARTIAL
10 PENETRATION ON FLOW IN UNCONFINED AQUIFERS CONSIDERING DELAYED
11 GRAVITY RESPONSE".

12 (K) "STREAMFLOW DEPLETION CALCULATION" MEANS AN EVALUATION OF
13 THE POTENTIAL STREAMFLOW DEPLETION IN WHICH ALL OF THE FOLLOWING
14 ARE DONE:

15 (i) THE STREAMBED CONDUCTANCE OF THE POTENTIALLY IMPACTED
16 STREAMS SHALL BE MEASURED IN-SITU USING SLUG TESTING, SEEPAGE METER
17 TESTING, OR BOTH.

18 (ii) AN AQUIFER PERFORMANCE TEST REPRESENTING THE PROPOSED
19 WITHDRAWAL LOCATION HAS BEEN COMPLETED.

20 (iii) AN ANALYSIS SHALL BE CONDUCTED TO CALCULATE STREAMFLOW
21 DEPLETION USING THE APPLICABLE METHOD OF HUNT, 1999; HUNT, 2003;
22 WARD AND LOUGH, 2011; OR A SIMILAR PEER-REVIEWED MODEL THAT
23 ASSESSES POTENTIAL STREAM DEPLETION. ~~THE ANALYSIS MAY ALSO BE~~
24 ~~CONDUCTED ON EXISTING WITHDRAWALS IN THE SAME WATER MANAGEMENT UNIT~~
25 ~~OR UNITS AS THE PROPOSED WITHDRAWAL IF APPLICABLE DATA IS~~
26 ~~AVAILABLE. THIS MAY BE USED TO PROVIDE ADDITIONAL EVIDENCE AS~~
27 ~~NEEDED TO DEMONSTRATE A PROPOSED WITHDRAWAL IS UNLIKELY TO CAUSE AN~~



1 ~~ADVERSE-RESOURCE IMPACT.~~

2 (I) "THEIS, 1935" MEANS THEIS, 1935: "THE RELATION BETWEEN THE
3 LOWERING OF THE PIEZOMETRIC SURFACE AND THE RATE AND DURATION OF
4 DISCHARGE OF A WELL USING GROUNDWATER STORAGE".

5 (M) "WARD AND LOUGH, 2011" MEANS WARD AND LOUGH, 2011: "STREAM
6 DEPLETION FROM PUMPING A SEMICONFINED AQUIFER IN A TWO-LAYER LEAKY
7 AQUIFER SYSTEM".

