See also Ord. 1979-11

CITY OF WESTLAKE, OHIO
ORDINANCE NO. 1978 - 47

AN ORDINANCE AMENDING SECTIONS 1 AND 2 OF ORDINANCE NO. 1978-8 ENTITLED "AN ORDINANCE ESTABLISHING PERFORMANCE STANDARDS AND STORM DRAINAGE CHARGES FOR REAL PROPERTY DEVELOPMENT IN THE CITY OF WESTLAKE AND DECLARING AN EMERGENCY" AND DECLARING AN EMERGENCY.

WHEREAS, this Council desires to amend Section 1 of Ordinance No. 1978-8 to provide for the adoption and attachment as Exhibit "A", Design Procedures, and

WHEREAS, this Council desires to amend Section 2 of Ordinance No. 1978-8 to provide for exemptions and the phasing of developments consisting of five acres or more.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF WESTLAKE, COUNTY OF CUYAHOGA AND STATE OF OHIO:

SECTION 1: That Sections 1 and 2 of Ordinance No. 1978-8 be and the same are hereby amended and as amended shall read as follows:

"SECTION 1: No person, firm, corporation, public agency, partnership or association shall develop any real property as hereinafter described, or connect or cause to be connected any building or structure, either directly or indirectly with a drain for the removal of surface, roof, ground or other water to be discharged into a ditch, swale, waterway, stream, or an existing storm drainage system from any real property hereinafter described without complying with the following performance standards and paying the charges hereinafter set forth:

1. For all developments to be improved within the City of Westlake, a storm drainage system shall be designed and constructed by the Developer, using on-site or off-site retardation basins and/or underground storage facilities which will reduce the developed storm water run-off from this development to two-thirds of the existing undeveloped storm water run-off using a ten (10) year design storm as set forth in the Uniform Standards for Sewage and Drainage Improvements as adopted by - The Cuyahoga County Sanitary Engineering Department - The City of Cleveland - The Cleveland Regional Sewer District - the Cuyahoga County Municipal Engineers Association - The Ohio Environmental Protection Agency and the Northeast Ohio Areawide Coordinating Agency and as embodied in the "City of Westlake Small Retarding Basin Design Procedure" which this Council specifically adopts and which procedure is attached hereto and made a part hereof as though fully rewritten herein and marked Exhibit "A". Present existing parcels of land consisting of less than one (1) acre in area shall be exempted from the requirements of Paragraph 1 of Section 1 of this Ordinance.

2. For all developments to be improved within the City, a drainage charge per gross acre of area to be developed, prorated at the rate of One Thousand One Hundred Dollars ($1,100.00) per acre shall be charged and paid to the City before each building permit is issued within the area to be developed. The charges hereinabove provided shall be placed in a special fund entitled "Storm Drainage Capital Improvement Fund" and shall be used only for the construction of off-site storm drainage improvements within the City, in accordance with the Master Storm Drainage Improvement Plan adopted by this Council and on file with the Clerk of Council.

3. Should the City require a Developer, upon the recommendation of the City Engineer or the City's Consulting Engineer and approval of Council, to reduce the developed storm water run-off from his development to substantially increase the requirement set forth in Paragraph 1 above, in order to further reduce the peak storm water discharge to the City's drainage system; or to reduce the number of retardation basins to be constructed and maintained within the City; or to combine the storm water storage requirements for two (2) or more developments in one (1) retardation basin to be located at a more strategic or better site, the City of Westlake may enter into an agreement through the Mayor, with the Developer under the following conditions:

(a) On any on-site or adjacent site retardation basin to be constructed by this Developer, the City will set-off the drainage charge as set forth in Paragraph 2 above by an amount equal to the estimated increased construction costs including cost of extra land area to this Developer for the construction of the enlarged retardation basin which is over and above the estimated construction costs for the retardation system as required under Paragraph 1 above. The estimated construction costs for both the retardation system required under Paragraph 1 above and this enlarged retardation basin shall be determined by the City Engineer and his determination shall be final.

(b) The maximum set-off in the drainage charge as set forth in Paragraph 2 above shall not exceed the amount of One Thousand One Hundred Dollars ($1,100.00) per acre of area to be developed.

(c) The Developer shall either (1) give the City, clear title to this retardation basin site while reserving to himself the right to use this area for recreation purposes,

or (2) grant the City an easement over this retardation basin site which gives the City the right to determine what other areas of the City may use this enlarged retardation basin to reduce the storm water run-off from their proposed development.

4. Should a Developer request to use any excess or surplus water storage capacity in a particular off-site retardation basin owned or controlled by the City as a substitution for all or part of the water storage volume required to reduce the developed storm water run-off from his development as set forth in Paragraph 1 above, upon the recommendation of the City Engineer or the City's Consulting Engineer and approval of Council, the City of Westlake may enter into an agreement through the Mayor, with the Developer to permit this Developer to use all or part of this surplus storage capacity in place of the Developer constructing an on-site or adjacent cite retardation basin for his development under the following conditions.

(a) The Developer shall pay to the City an amount equal to the City's costs for constructing or acquiring the storage capacity to be used by this development in this particular retardation basin. The City's costs shall be calculated by the City Engineer on a prorated volume of storage basis using historical costs to the City for constructing or acquiring this particular retardation basin and the City Engineer's determination shall be final.

SECTION 2: Applicability, Exemptions and Phasing.

1. Applicability

From and after the effective date of this Ordinance the terms and provisions thereof shall be applicable as follows:

(a) Where a developer has received approval of a Preliminary Plan for a Major subdivision and the Final Plat has not been approved by the Council, the developer or owner of the subdivision shall comply with all the terms and provisions of this Ordinance.

(b) Where a developer has received approval of the Final Plat of a Major Subdivision by the Council the developer or owner of each vacant sublot who has not made application for a building permit shall comply with the provisions of Paragraph 2 of Section 1 of this Ordinance.

(c) Where a developer has received approval prior to the adoption of this Ordinance of the Final Plat of a Major Subdivision by this Council and the Ordinance adopted by this Council provides for the payment of a total storm drainage charge of Five Hundred Dollars ($500.00) per sublot before a building permit is issued for construction on such sublot, the developer or owner shall be exempt from the terms and provisions of this Ordinance.

(d) To developers in all other cases where land is to be developed not specifically exempted from the terms and provisions of this Ordinance.

2. Exemptions.

(a) Farms:

The developer or owner of land or his agent developing or using land for the growing of crops, flowers, fruit or nursery stock for sale, in the natural soil unenclosed by any structure other than a fence, shall be exempt from the provisions of this Ordinance. Such exemption shall be limited to the area land designated by the owner and approved by the Planning Commission which is to be used to grow such crops, flowers, fruit or nursery stock. The area used for the homesite, barns, sheds or accessory buildings shall be subject to Section 1, paragraphs 1 and 2 of this Ordinance.

(b) Golf Courses

The developer or owner of land or his agent developing or using land in an outdoor area designed for the playing of golf as defined by the Zoning Code shall be exempt from the provisions of Section 1, paragraph 1 and 2 of this Ordinance. Such exemption however, shall be limited to the land area for which the actual use of the area is designated for greens, fairways and roughs and adjacent thereto within the geographic area of the golf course.

The developer, owner or his agent shall be entitled to such exemption to the above described areas on condition that the developer, owner or his agent further reduces the run-off from the total golf course land area after development to one-half (1/2) of the existing storm water run-off using a twenty-five (25) year design storm of two (2) hour duration by the construction of on-site retardation basins or other storm water controls. The land area of the golf course which is to be used for the club-house, pro-shop and parking as shown on the development plan approved by the Planning Commission shall be subject to the provisions of Section 1, paragraph 2 of this Ordinance.

(c) Governmental Agencies Recreation Areas.

Governmental Agencies, in the development of land areas to be used for recreational purposes shall be exempt from the provisions of Section 1, paragraph 2 of this Ordinance.

3. Phasing Developments.

Any developer, owner or his agent of real property in this City, having a tract of land consisting in area of five (5) acres or more, may, with the approval of the Planning Commission, develop his real property in phases provided that such developer, owner or his agent complies with the terms and conditions of this Ordinance as it applies to the area of the property to be developed in the phase approved for development by the Planning Commission."

SECTION 2: That it is found and determined that all formal actions of this Council concerning and relating to the adoption of this Ordinance were adopted in an open meeting of this Council and that all deliberations of this Council and of any of its committees that resulted in such formal action were in meetings open to the public, in compliance with all legal requirements, including Section 121.22 of the Ohio Revised Code.

SECTION 3: That this Ordinance is hereby declared to be an emergency measure immediately necessary for the preservation of the public health, safety and welfare, and for the further reason it is immediately necessary to provide for adequate control against flooding to protect the residents and property values of the residents in the City, and further provided it receives the affirmative vote of all members elected to Council, it shall take effect and be in force immediately upon its passage and approval by the Mayor.

1st. rdg. 4/20/78
2nd. rdg. 5/4/78
PASSED: May 18, 1978

Robert M. Peterson
Robert M. Peterson, President of Council

Presented to Mayor: May 19, 1978

Approved: May 19, 1978

ATTEST:

Louise S. Hall
Louise S. Hall, Clerk of Council

Alexander R. Roman
Alexander R. Roman, Mayor

posted 5/22/78

EXHIBIT "A"

ORDINANCE NO 1978-47

CITY OF WESTLAKE
SMALL RETARDING BASIN
DESIGN PROCEDURE

MAXIMUM DISCHARGE RATE

On-site storm water storage (one of the options set forth in Ordinance No. 1978=8) is required of new developments within the City of Westlake to prevent the resultant increased storm run-off caused by development from aggrevating flooding conditions along the drainage streams in the watershed. For this reason, the duration of the design storm used to calculate allowable discharge rates from all on-site retarding basins is the concentration time of the main stream of the watershed on which the site to be developed is located. For convenience in calculations, the concentration times of all main streams in the City of Westlake is considered to be two (2) hours. By Ordinance, allowable discharge from developed sites or on-site retarding basins is limited to 2/3 of the run-off from the land in its present state of development. Hence the maximum discharge rate for any on-site retarding basin is found by multiplying together: the factor 2/3, the run-off coefficient for current land use, the tributary area in acres, and the rainfall intensity for a ten year two hour duration storm; i.e. Q_{10} = 2/3 x C X A X 1.02"/Hr. (Q_{10} in CFS). The allowable discharge rate of undeveloped land after development is therefore limited to 0.204 CFS per acre.

VOLUME OF STORAGE REQUIRED

In order to calculate the volume of storage required to achieve the allowable discharge rate, the total volume of run-off for ten year storms of various durations has to be calculated to determine the maximum volume of storage the retarding basin must hold. For each storm duration, the total volume of run-off from this storm is calculated and from this volume is deducted the amount of water discharged from the retarding basin while the storm inflow into the retarding basin exceeds the maximum allowable discharge rate. The maximum remainder is the total volume of storage required for this particular retarding basin.

TEN YEAR RAINFALL INTENSITY-DURATION TABLE

The following rainfall intensity-duration table is to be used for the calculation of ten year inflow hydrographs to determine the maximum storage requirement in retarding basin design:

(A) DURATION OF STORM IN MINUTES	(B) RAINFALL INTENSITY IN INCHES PER HOUR
10	4.95
11	4.78
12	4.63
13	4.48
14	4.34
15	4.21
16	4.09
17	3.98
18	3.87
19	3.76
20	3.67
21	3.57
22	3.49
23	3.40
24	3.32
25	3.25
26	3.17
27	3.10
28	3.04
29	2.97
30	2.91
35	2.64
40	2.41
45	2.22
50	2.06
55	1.92
60	1.80
70	1.60
80	1.43
90	1.30
100	1.19
110	1.10
120	1.02

RUN-OFF COEFFICIENTS

The following run-off coefficients and pervious area percentages are suggested for use in retarding basin design:

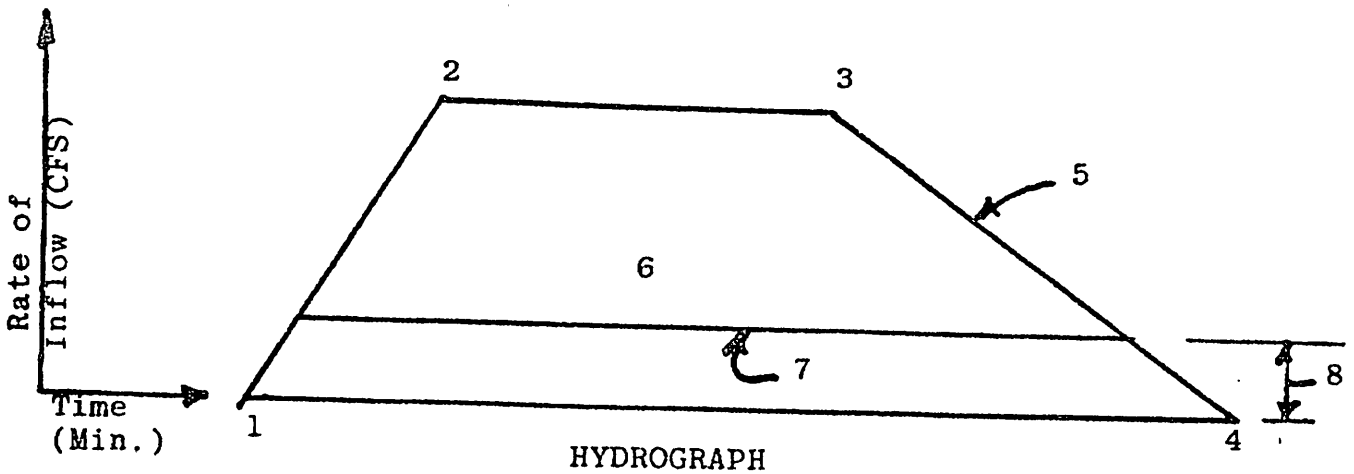
LAND USE	PERVIOUS AREA %	IMPERVIOUS AREA %	RUN-OFF COEFFICIEN "C"
Undeveloped Land	100	0	0.30
Rural Areas	90	10	0.35
Residential Areas	75	25	0.45
Apartment Areas	25	75	0.75
Commercial Areas	10	90	0.84
Industrial Areas	25	75	0.75

DISCHARGE CONTROLS

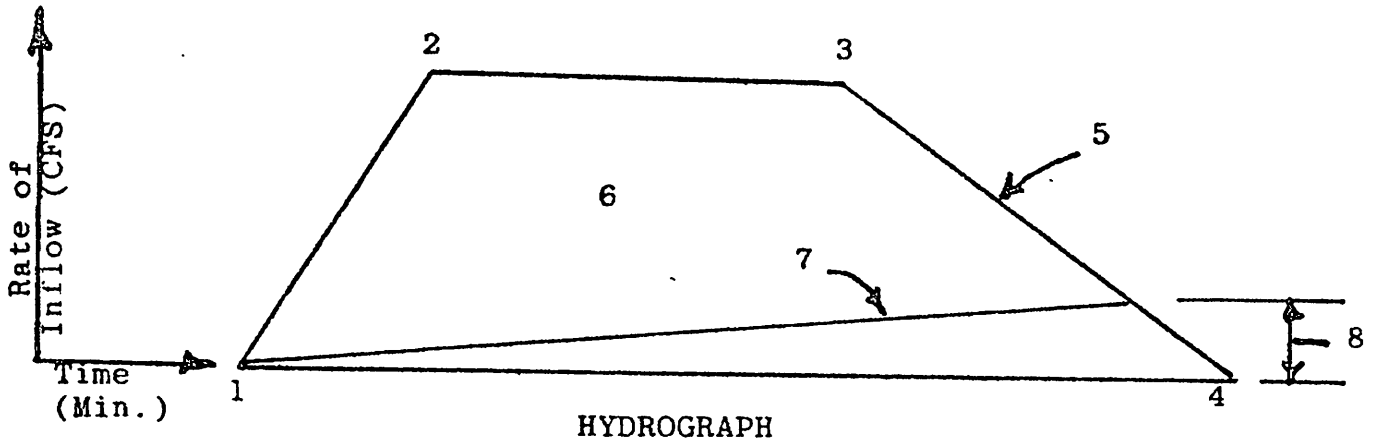
There are two (2) types of discharge controls for on-site retarding basins that have been considered for use in the City of Westlake. One discharge control type (off-stream retarding basins) permits all inflows less than the maximum discharge rate to pass downstream without storage. All inflows in excess of this maximum discharge rate are then diverted to storage in the retarding basin for release after the passage of the storm. Discharge under the other type of control (on-stream retarding basins) is dependent upon retarding basin storage depth and discharge only reaches the maximum discharge rate at maximum retarding basin storage depth. This type of retarding basin therefore reaches its maximum storage depth when falling inflow rate drops down to equal maximum discharge rate.

The on-stream retarding basin type of control is the one most generally used. The shape of the discharge rate curve for this type of control is generally an ogee curve, but for simplicity in analysis can be assumed to be a straight line from the origin of rainfall to its point of intersection with the inflow hydrograph at the maximum discharge rate.

The effect of these two types of control systems are illustrated by the hydrographs on the next page:



HYDROGRAPH
OFF-STREAM RETARDING BASIN



HYDROGRAPH
ON-STREAM RETARDING BASIN

LEGEND

1. Beginning of rainfall (Inflow = zero)
2. Concentration time of tributary watershed (Inflow = rational equation with rainfall intensity at end of storm)
3. End of rainfall or duration of storm (Inflow = rational equation with rainfall intensity at end of storm)
4. Calculated time of end of run-off (Inflow = zero)
5. Inflow hydrograph
6. Volume of storage required
7. Discharge curve
8. Maximum allowable discharge

Note: The trapezoidal shape of the above hydrographs will become a triangle if the time of concentration of the tributary watershed equals the duration of rainfall.

DESIGN EXAMPLE

DATA

WATERSHED AREA = 36.4 ACRES
CONCENTRATION TIME = 15 MIN.
EXISTING LAND USE = UNDEVELOPED
ALLOWABLE DISCHARGE = 0.204 CFS/AC.
FUTURE LAND USE = RESIDENTIAL
I_{10} @ 15 MIN. = 4.21 "/HR.
C = 0.45
INFILTRATION RATE = 0.5 "/HR.

CALCULATION OF MAXIMUM ALLOWABLE DISCHARGE RATE

$Q_{10} = 0.204\ A$

$Q_{10} = 0.204 \times 36.4$

$Q_{10} = 7.43$ CFS

CALCULATION OF REQUIRED STORAGE VOLUME

(1) RETARDING BASIN TYPE = ON-STREAM
DURATION OF STORM = 15 MIN.

PEAK INFLOW RATE

$Q_{10} = CIA$

$Q_{10} = 0.45 \times 4.21 \times 36.4$

$Q_{10} = 69$ CFS @ 15 MIN.

RUN-OFF RATE

$I_{10} = (0.25 \times 4.21) + (0.75 \times (4.21 - 0.5))$

$I_{10} = 1.05 + 2.78$

$I_{10} = 3.83$ "/HR.

TOTAL INFLOW VOLUME

$$V_T = \frac{3.83}{12} \times \frac{15}{60} \times 36.4 \times 43{,}560$$

$V_T = 126{,}520$ C.F.

END OF RUN-OFF TIME

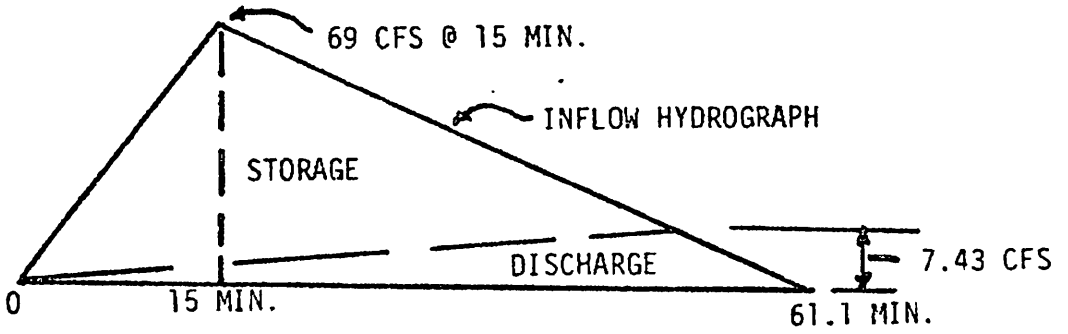
$T_E = \frac{126520 \times 2}{69 \times 60}$

T_E = 61.1 MIN.

VOLUME OF STORAGE REQUIRED

TOTAL INFLOW = 126,520 C.F.
LESS DISCHARGE = $\frac{7.43}{2}$ x 61.1x60 = 13,620 C.F.

STORAGE VOLUME = 112,900 C.F.
OR 2.59 AC-FT.



HYDROGRAPH FOR 15 MIN. STORM

RETARDING BASIN TYPE = ON-STREAM

2) DURATION OF STORM = 30 MIN.
I_{10} @ 30 MIN. = 2.91 "/HR.

PEAK INFLOW RATE

$Q_{10} = CIA$
$Q_{10} = 0.45 \times 2.91 \times 36.4$
$Q_{10} = 47.7$ CFS

RUN-OFF RATE

$I_{10} = (0.25 \times 2.91) + (0.75(2.91 - 0.5))$
$I_{10} = 0.73 + 1.81$
$I_{10} = 2.54$ "/HR.

DESIGN EXAMPLE (CONT'D.)

TOTAL INFLOW VOLUME

$$V_T = \frac{2.54}{12} \times \frac{30}{60} \times 36.4 \times 43{,}560$$

$$V_T = 167{,}810 \text{ C.F.}$$

END OF RUN-OFF TIME

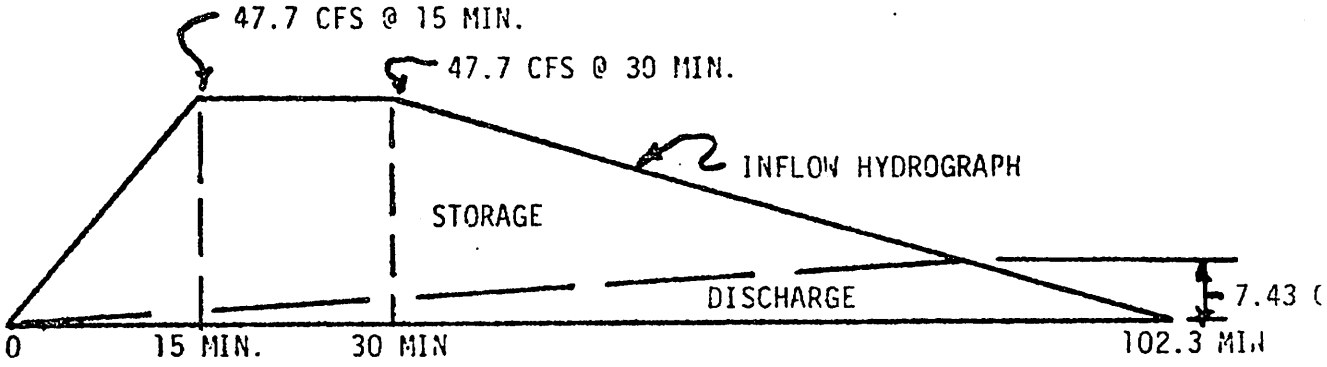
$$T_E = \frac{(167.810 \times 2)}{(47.7 \times 60)} - 15$$

$$T_E = 117.3 - 15$$

$$T_E = 102.3 \text{ MIN.}$$

VOLUME OF STORAGE REQUIRED

TOTAL INFLOW =		167,810
LESS DISCHARGE = $\frac{7.43}{2} \times 102.3 \times 60$	=	22,800
STORAGE VOLUME	=	145,010 C.F.
OR		3.33 AC-FT.



HYDROGRAPH FOR 30 MIN. STORM

DESIGN EXAMPLE (CONT'D.)

(3) RESULTS OF SIMILAR CALCULATIONS MADE FOR STORMS OF INCREASING DURATIONS ARE TABULATED BELOW:

STORM DURATION MIN.	PEAK INFLOW RATE CFS	VOLUME OF INFLOW C.F.	VOLUME OF DISCHARGE C.F.	STORAGE REQUIRED C.F.
15	69.0	126,520	13,620	112,900
30	47.7	167,810	22,800	145,010
40	39.5	179,320	28,180	151,140
*50	33.7	186,040	33,170	152,870*
60	29.5	188,380	37,450	150,930
70	26.2	188,710	41,240	147,470

*MAXIMUM STORAGE REQUIRED

THE MAXIMUM STORAGE REQUIRED FOR THIS ON-STREAM RETARDING BASIN WITH A MAXIMUM ALLOWABLE DISCHARGE OF 7.43 CFS IS THEREFORE A VOLUME OF 152,870 C.F. OR 3.51 AC.-FT.