2014 Rain Event

May 12, 2014

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CITY OF WESTLAKE
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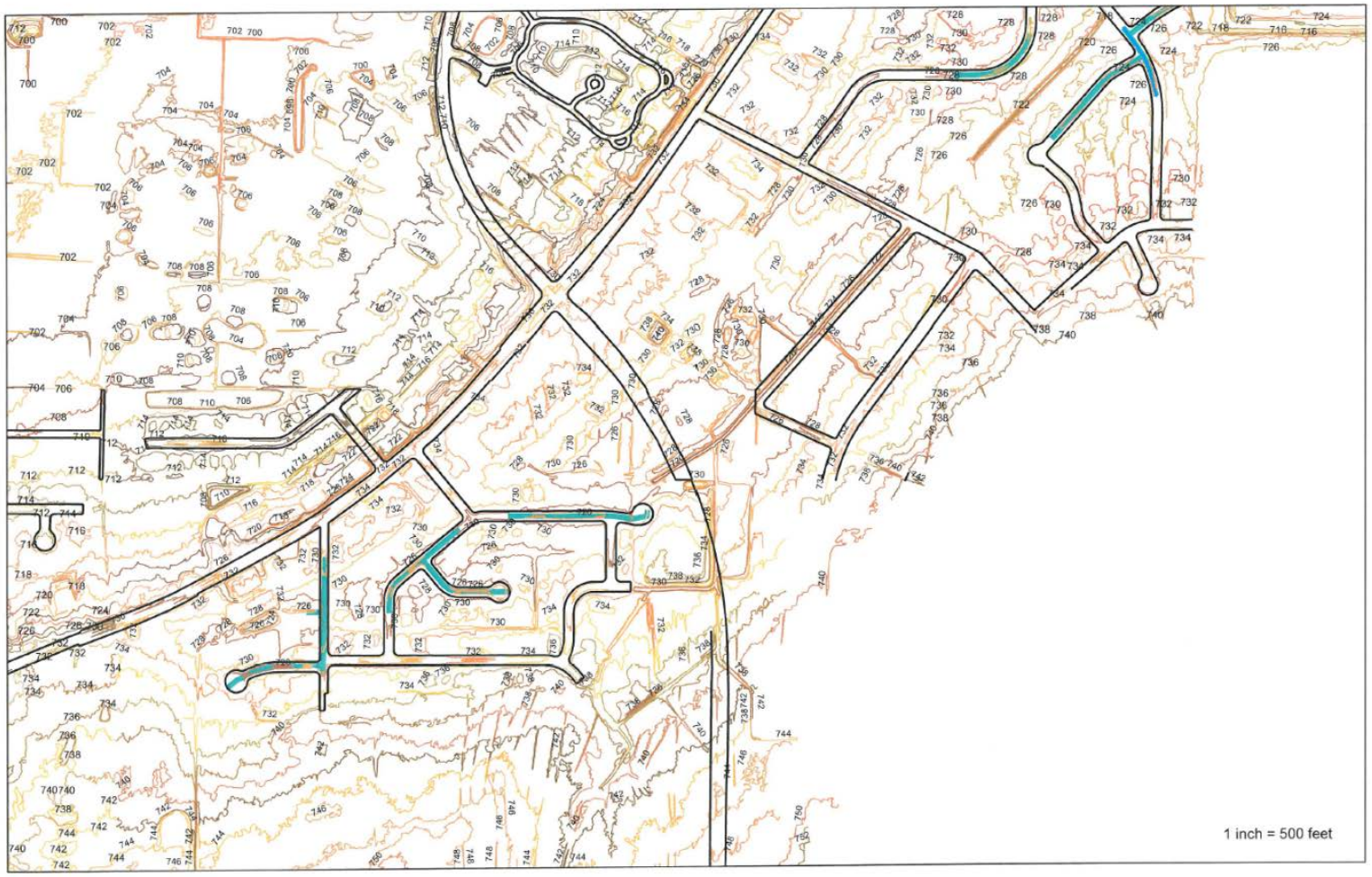
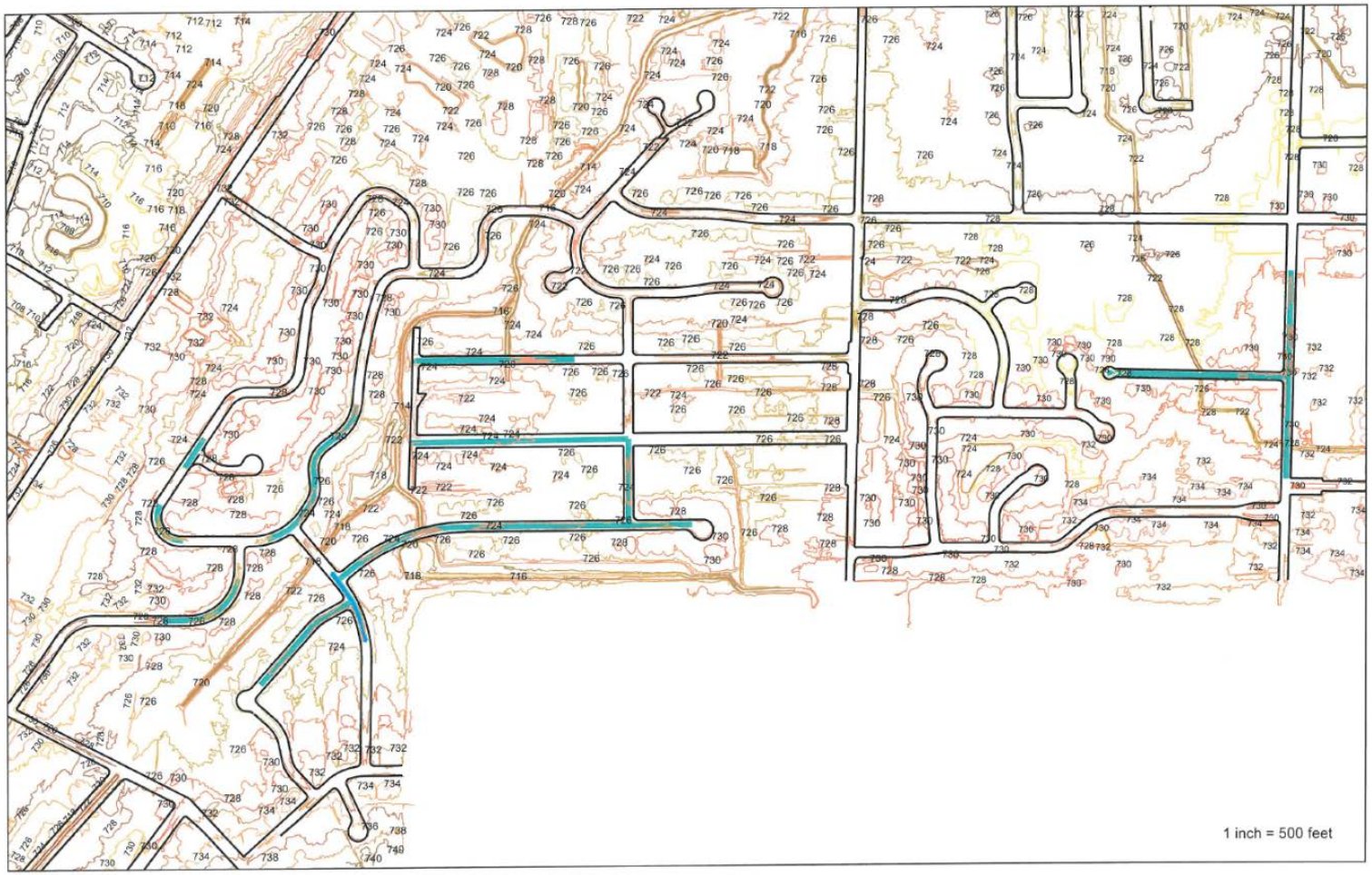
March 12, 2014
Major Rain Event

- OVER 4” OF RAIN IN THE SOUTHERN PART OF THE CITY
- MAJOR STREET FLOODING
  - HOLLYWOOD DRIVE
  - DUNFORD AVENUE
  - CANTERBURY RD/STRAWBERRY RD
  - SOUTHBRIDGE DRIVE
  - HARDING DRIVE
  - BREWSTER DRIVE
  - BRETTON WOODS SUBDIVISION

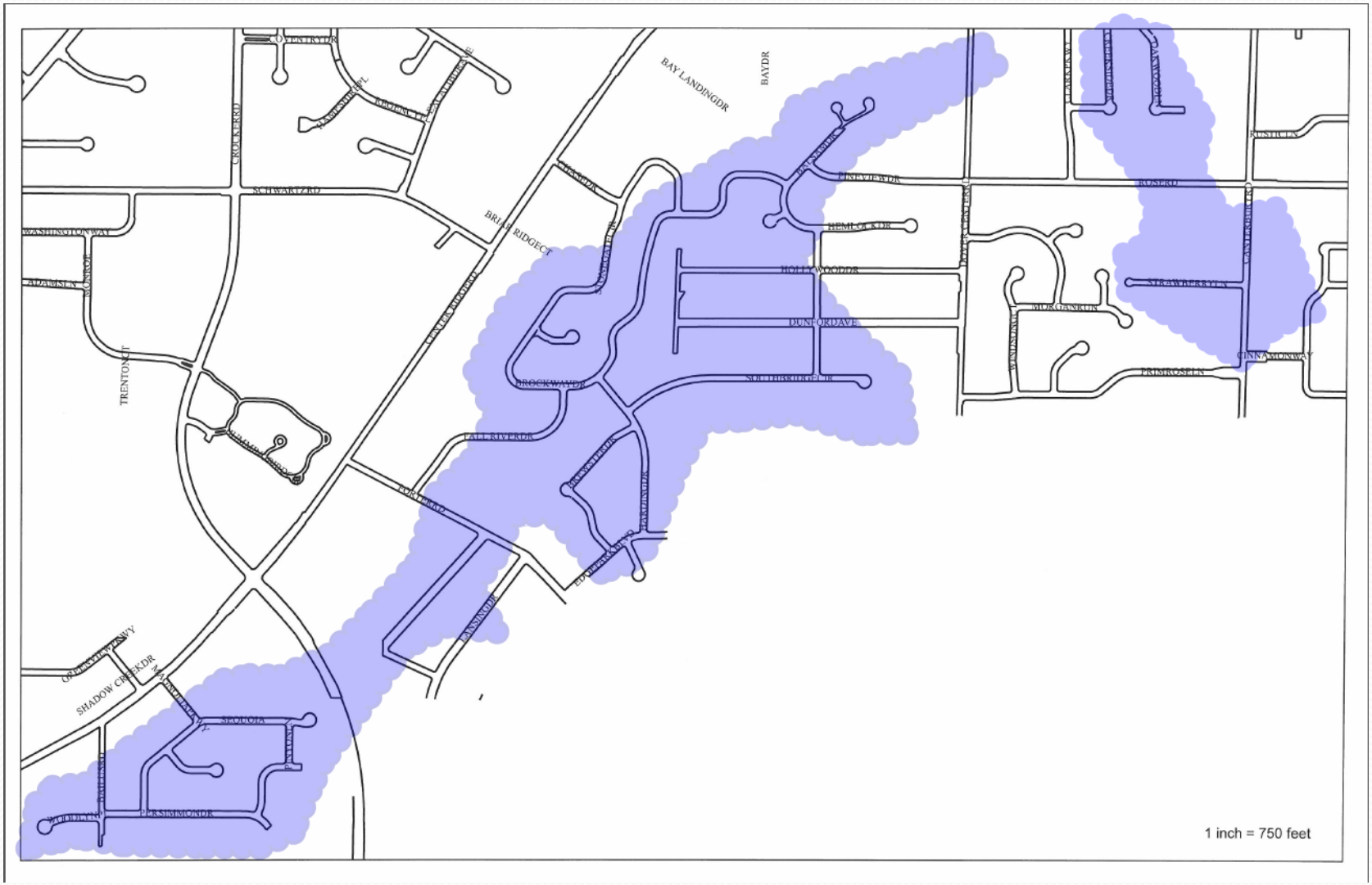
Flooded Area May 12, 2014



Flood Area May 12, 2014

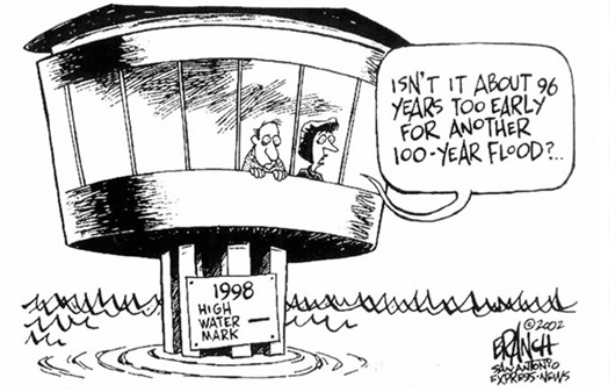


Flood Hazard Area



WHAT IS A 100 YEAR FLOOD EVENT?

1. The term "**100-year flood**" is a term often used to describe a flood that has a 1% chance of occurring in any year.
2. Phrase could be misleading, and often causes people to believe these floods happen every 100 years on average.
3. The truth is, these floods can happen quite close together, or not for long stretches of time, <u>but the risk of such floods remains constant from year to year.</u>



FLOOD RISK?

1. **Everyone is at risk.**
2. Floods can happen almost anywhere. They are not limited to coastal areas or near large rivers.
3. They happen more often and in more locations than you may realize.
4. In fact, floods are the most common natural disaster in the U.S. and cause the most property damage.

FEMA FLOOD RISK

1. HIGH RISK AREAS
    1. 25% Chance of flooding during a 30-year mortgage.
    2. Owners with mortgage required to buy flood insurance.
    3. Flood map zones A and V.
2. MODERATE TO LOW RISK AREAS
    1. Risk of flooding is reduced but not completely removed.
    2. Flood insurance is not required for a mortgage, but is recommended by FEMA.
    3. Nearly 20% of flood insurance claims come from this category.
    4. Flood map zones B, C or X.
3. UNDETERMINED-RISK AREA
    1. No flood-hazard analysis has been conducted in these areas, but a flood risk still exists.
    2. Flood map zone D.

HISTORICAL RAIN EVENTS

- HURRICANE SANDY (2012)

  THREE DAYS=4.51”

- 5-12-14 RAIN EVENT (3 HOURS)

  4.7” @ Meadowood G.C.

  4.44” @ North Olmsted

  6.00” @ North Ridgeville

Rainfall (inches) for given recurrence interval

Duration	2-month	3-month	4-month	6-month	9-month	1-year	2-year	5-year	10-year	25-year	50-year	100-year
10-day	1.70	2.05	2.36	2.78	3.19	3.47	4.29	5.34	6.17	7.30	8.19	9.14
5-day	1.37	1.64	1.86	2.15	2.47	2.69	3.34	4.23	4.95	5.96	6.82	7.74
72-hr	1.26	1.48	1.67	1.94	2.23	2.42	2.99	3.72	4.34	5.31	6.15	7.09
48-hr	1.18	1.38	1.53	1.78	2.04	2.22	2.75	3.42	3.99	4.87	5.66	6.55
24-hr	1.12	1.31	1.43	1.65	1.88	2.04	2.50	3.10	3.60	4.39	5.11	5.89
18-hr	1.06	1.23	1.34	1.56	1.77	1.92	2.35	2.91	3.38	4.13	4.80	5.54
12-hr	0.97	1.13	1.24	1.43	1.63	1.77	2.17	2.70	3.13	3.82	4.45	5.12
6-hr	0.84	0.98	1.07	1.24	1.41	1.53	1.88	2.32	2.70	3.29	3.83	4.42
3-hr	0.72	0.84	0.92	1.06	1.21	1.31	1.60	1.98	2.30	2.81	3.27	3.77
2-hr	0.65	0.76	0.83	0.96	1.09	1.18	1.45	1.80	2.09	2.55	2.96	3.42
1-hr	0.53	0.61	0.67	0.78	0.88	0.96	1.17	1.46	1.69	2.06	2.40	2.77
30-min	0.41	0.48	0.52	0.61	0.69	0.75	0.93	1.15	1.33	1.62	1.89	2.18
15-min	0.30	0.35	0.38	0.45	0.51	0.55	0.68	0.84	0.97	1.19	1.38	1.59
10-min	0.24	0.28	0.30	0.35	0.40	0.43	0.52	0.65	0.76	0.92	1.07	1.24
5-min	0.13	0.15	0.17	0.19	0.22	0.24	0.30	0.37	0.43	0.53	0.61	0.71

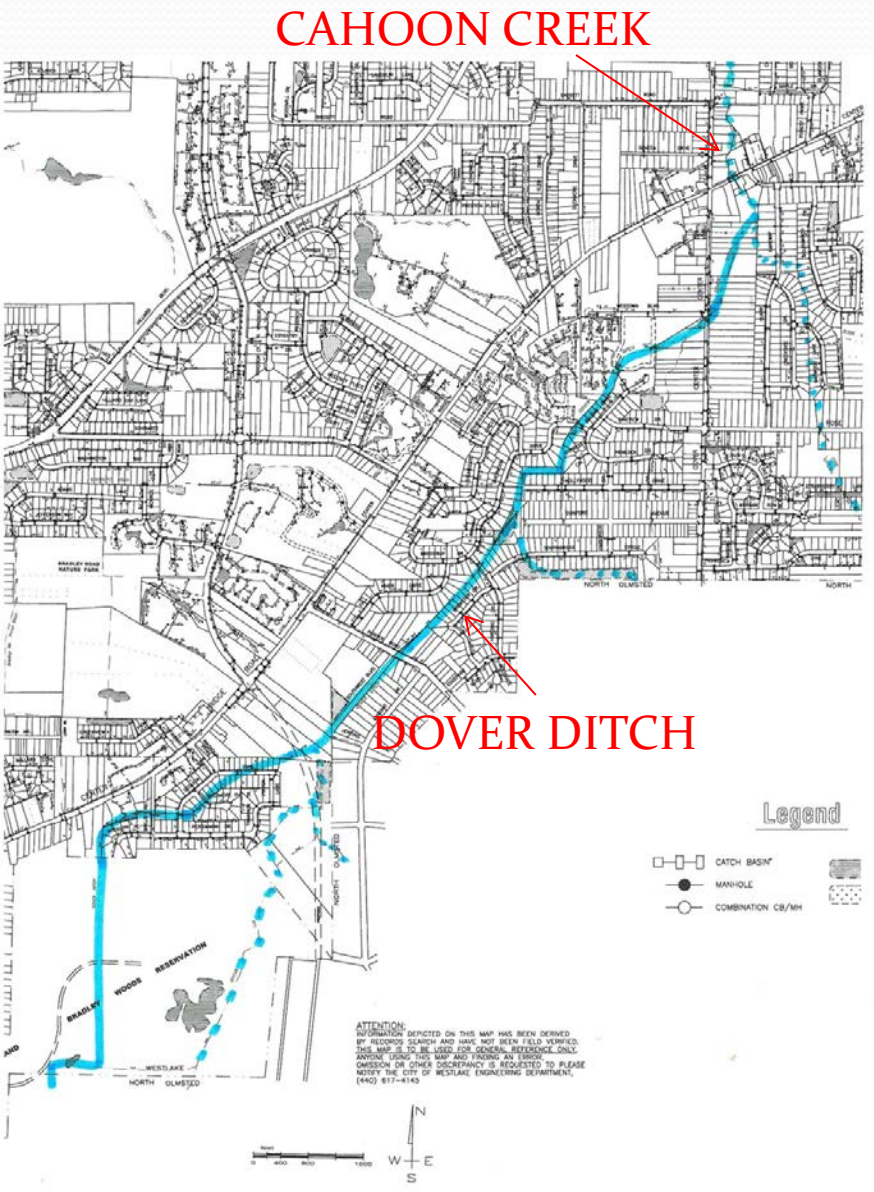
TOP 10 RAIN EVENTS IN 100 YEARS

RANK	DATE	RAIN
1	9/7/1996	4.59
2	8/20/2005	3.55
3	8/13/1994	3.55
4	5/24/1955	3.36
5	10/15/1954	3.36
6	7/27/1928	3.38
7	9/12/1938	3.34
8	8/7/2007	3.33
9	2/28/2011	3.09*
10	2/6/2008	2.5*
11	05/12/2014	4.7

*SIGNIFICANT SNOW MELT

DOVER DITCH

- CONNECTS TO CAHOON CREEK
- TRIBUTARY AREA
  - 2,200 ACRES
  - 100 YEAR FLOW
    - 729 CFS
    - 330,000 GALLONS/MIN
    - VOLUME OF WATER IN OLYMPIC SIZE POOL - < 2 MINUTES
  - WESTLAKE & NORTH OLMSTED



2008 ZWICK STUDY-DOVER DITCH

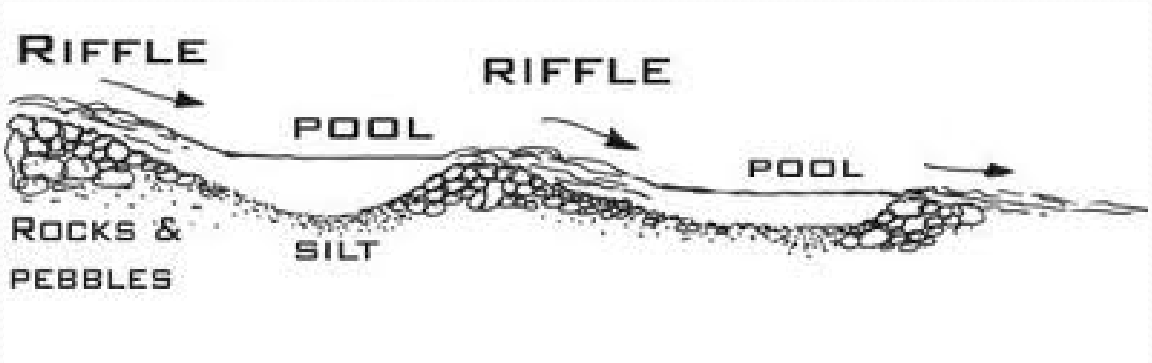
2008 ZWICK STUDY-DOVER DITCH

- PRIVATE BRIDGES ANALYZED
  - CAPACITY
  - HEIGHT
- CONCLUSION- IF THE BRIDGES ARE REMOVED THE WATER LEVEL (100 YEAR RAIN) WILL BE **MINIMALLY** LOWERED
  - DOVER CENTER
  - WESTOWN
  - SHERWOOD
  - HOLLYWOOD
  - HARDING

RE-GRADING OF DOVER DITCH

- THE EXISTING PROFILE OF THE DITCH IS NOT UNIFORM AND IS UNEVEN.

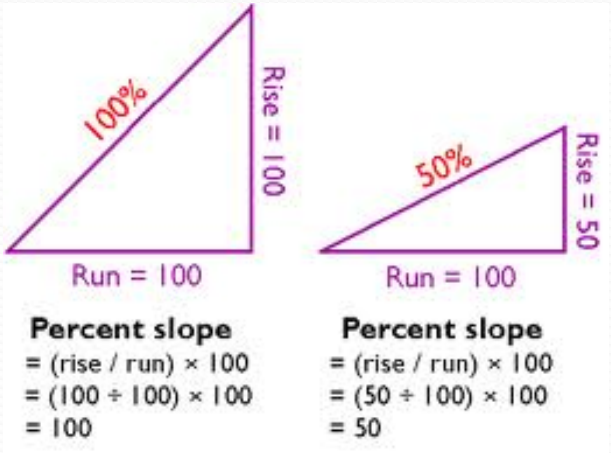
- HYDROSPHERE ENGINEERING & CUYAHOGA COUNTY ENGINEER
  - LEVELING OUT THE DITCH WILL NOT HELP WITH THE FLOODING
  - THE DITCH WAS HISTORICALLY STRAIGHTENED AND IS NOW NATURALLY REESTABLISHING IT'S RIFFLE POOL PROFILE



DOVER DITCH LOWERING

- DITCH **CAN NOT** BE LOWERED DUE TO FLAT SLOPE AND FEDERAL ENVIRONMENTAL REGULATIONS IN PLACE

- CAHOON CREEK TO HARDING- **FLAT**
  - DOWNSTREAM SECTION- 2,000 FEET
    - .15% SLOPE
    - TOTAL FALL OF 3 FEET
  - UPSTREAM SECTION-5,000 FEET
    - .04% SLOPE
    - TOTAL FALL OF 2 FEET



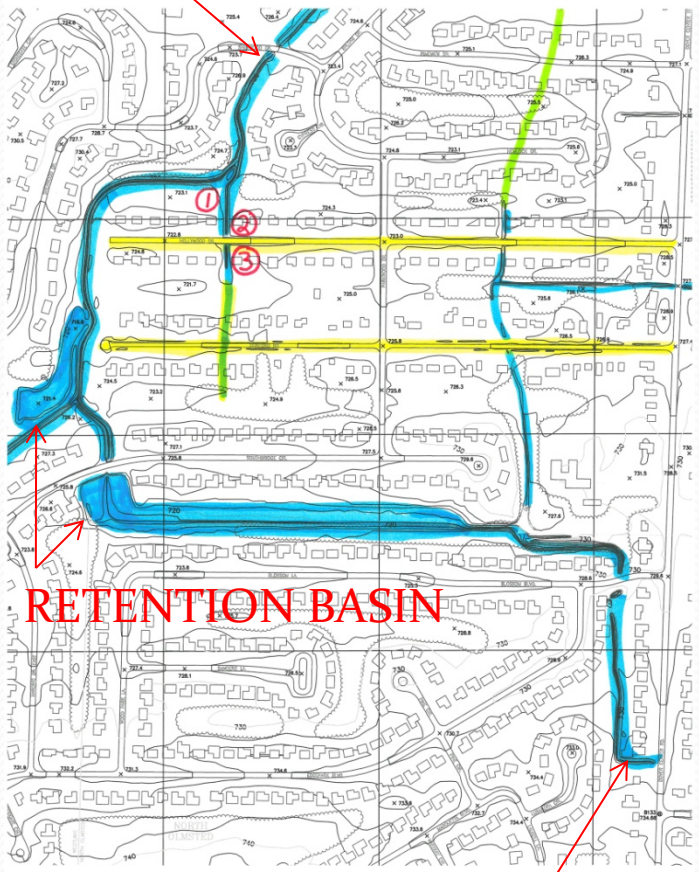
HOLLYWOOD / DUNFORD AREA

- DOVER DITCH
- EHLE LATERAL
  - 242 ACRES

PHOTO #1

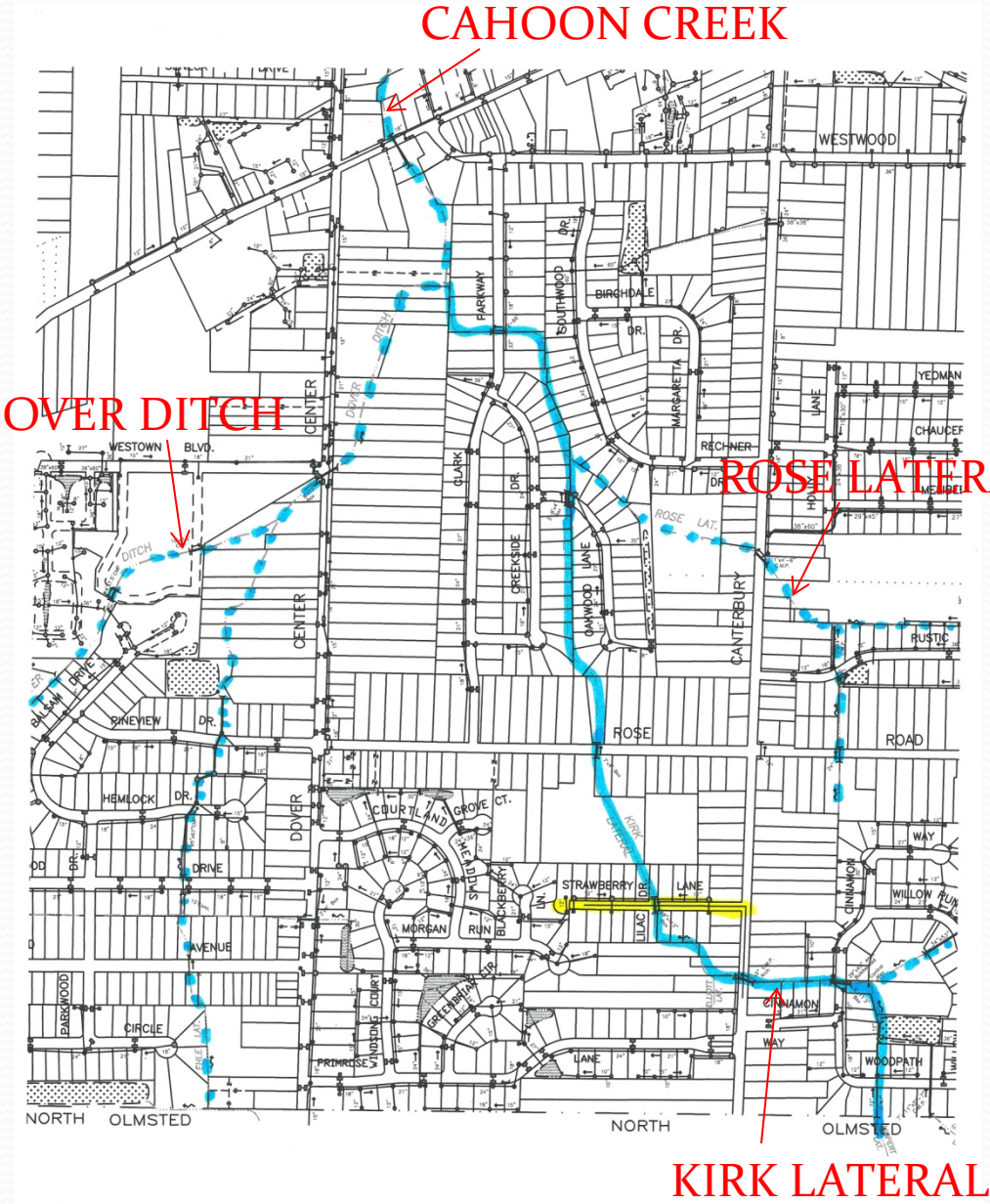
PHOTO #2

PHOTO #3

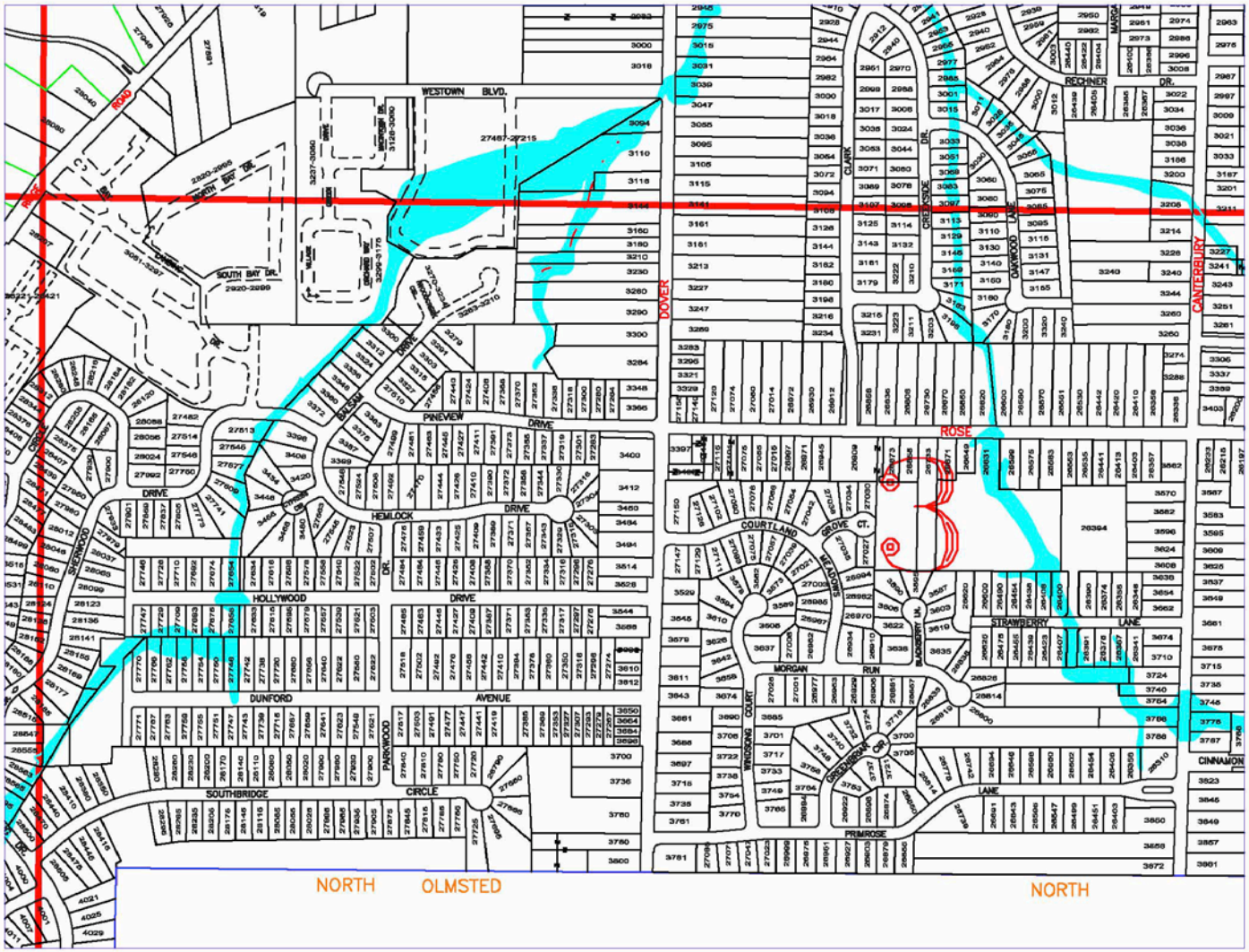


STRAWBERRY LANE AREA

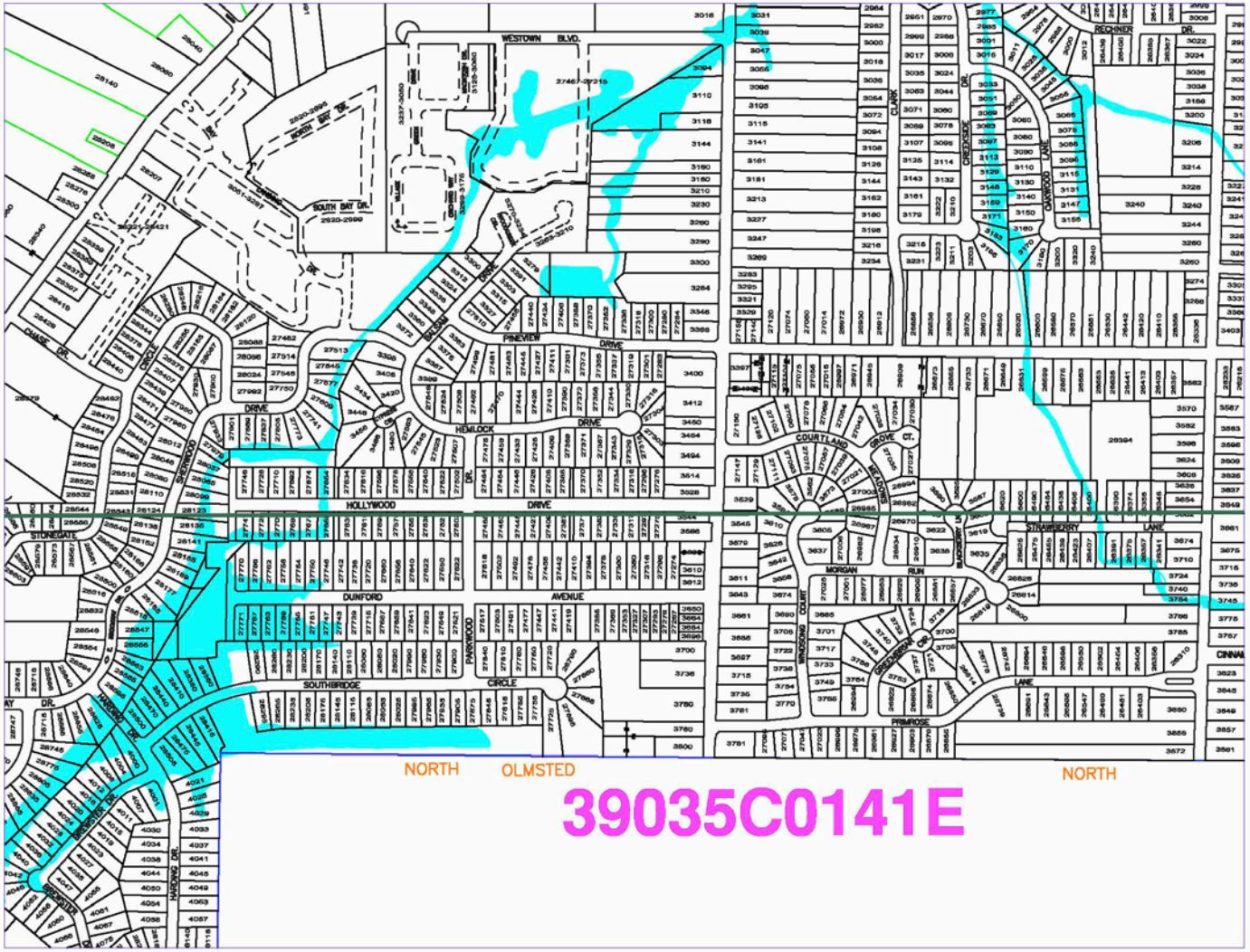
- KIRK LATERAL
  - CONNECTS TO CAHOON CREEK
  - TRIBUTARY AREA
    - 615 ACRES
    - WESTLAKE & N.O



1978 FEMA FLOOD PLAIN MAP



2010 FEMA FLOOD PLAIN MAP

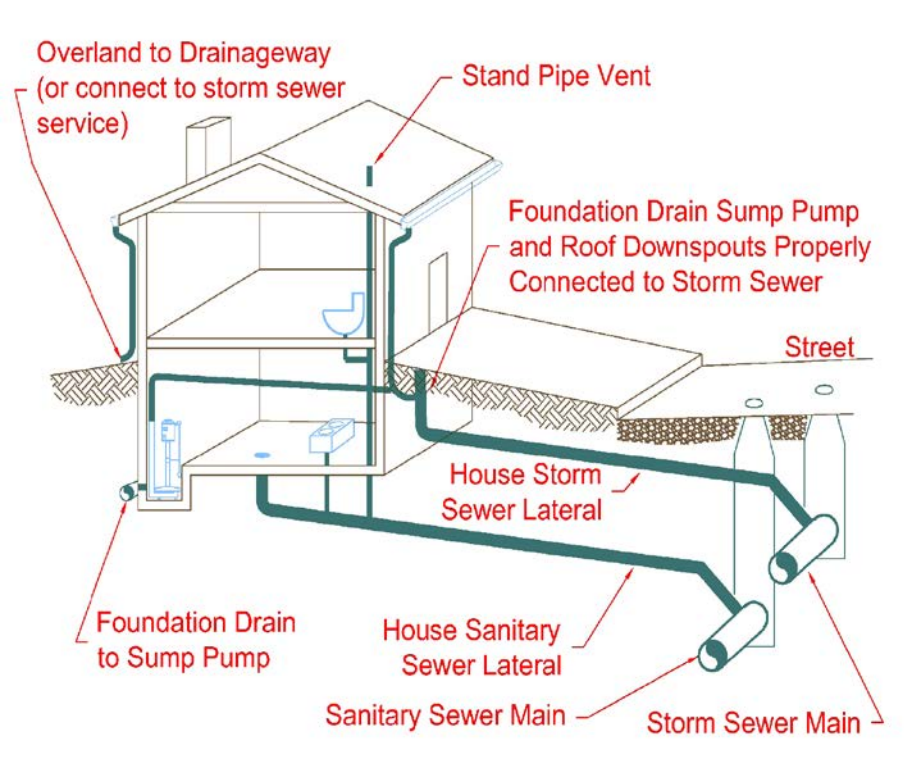


STORM SEWER DESIGN

- PRIMARY STREETS- 10 YEAR STORM
- SECONDARY STREETS- 5 YEAR STORM
- RETENTION BASIN- 10 YEAR STORM
- COUNTY CULVERTS- 25 YEAR STORM

HOUSE PLUMBING

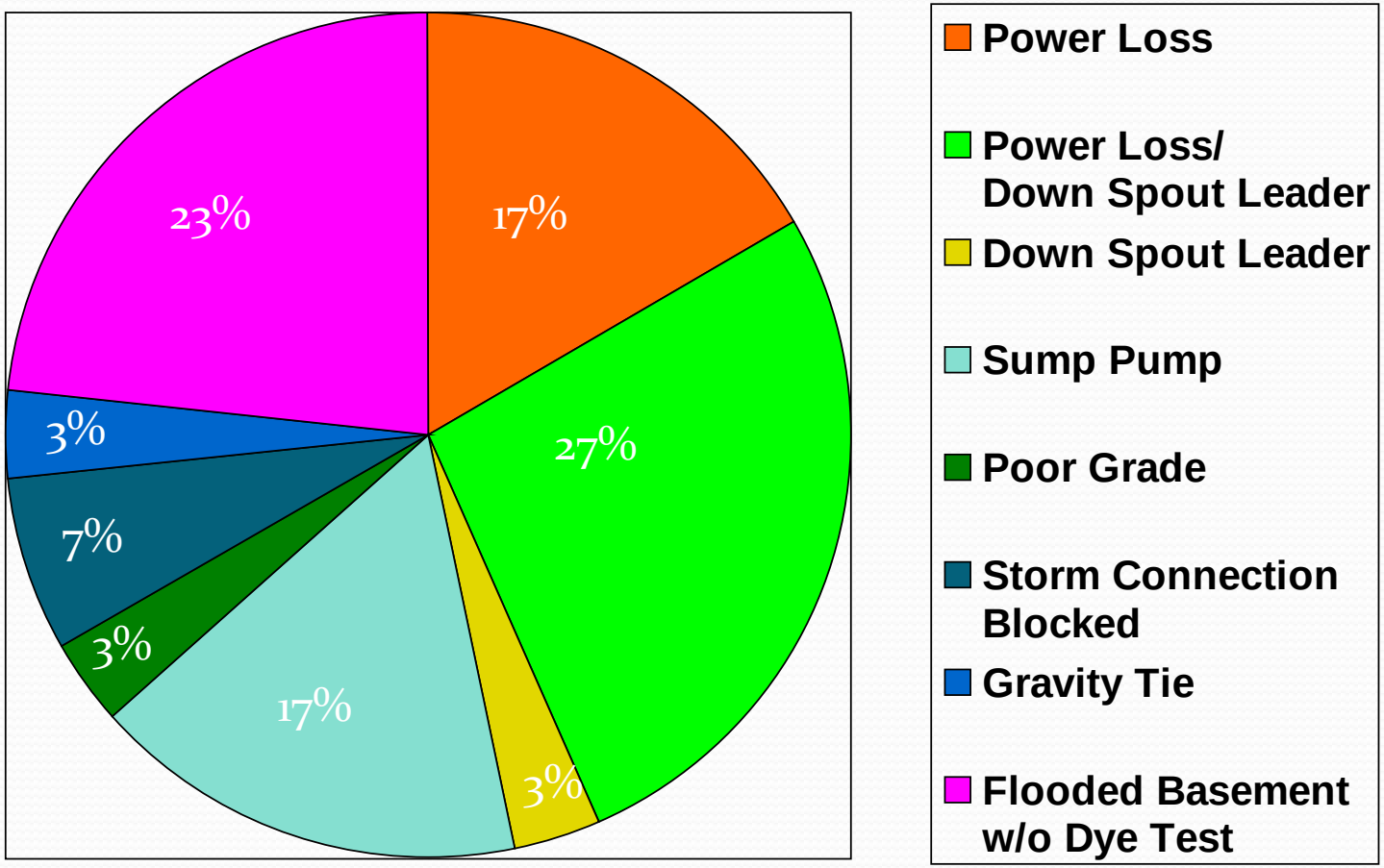
- STORM SEWER
  - DOWNSPOUTS
  - FOUNDATION DRAIN
  - SUMP PUMP
  - YARD/DRIVEWAY DRAINS
- SANITARY SEWER
  - SHOWERS
  - SINKS
  - TOILETS
  - WASHING MACHINE
- FLOOR DRAINS
  - STORM OR SANITARY



BASEMENT FLOODING

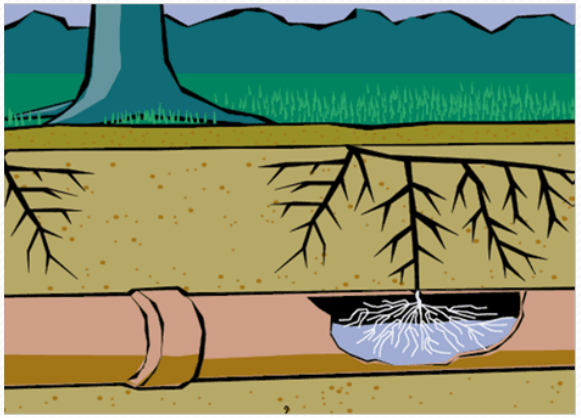
- STORM WATER INFILTRATION
  1. EXCESSIVE WATER AT FOUNDATION
     - COMPROMISED FOUNDATION DRAIN
     - SUMP PUMP FAILURE
     - GRAVITY TIE
     - COMPROMISED DOWNSPOUT LEADER
     - POOR GRADE AT FOUNDATION
  2. COMPROMISED WATERPROOFING / BACKFILL
  3. COMPROMISED STORM CONNECTION
- SANITARY BACK-UP

2005 ESTATES BASEMENT FLOOD STUDY



COMPROMISED PLUMBING

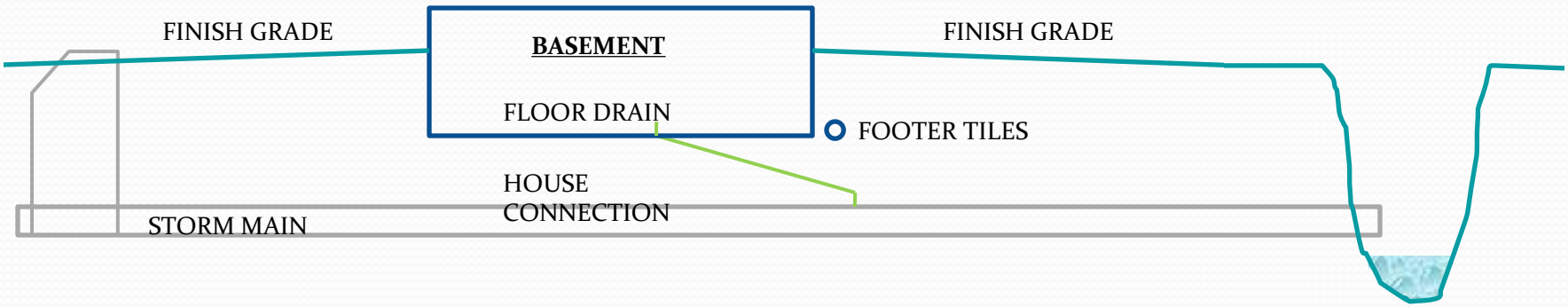
- IF THE DOWNSPOUT LEADER IS COMPROMISED WATER IS NOT DRAINED AWAY FROM THE HOUSE AND CONTRIBUTES TO BASEMENT FLOODING
- ALSO A COMPROMISED DOWNSPOUT IS A PATH FOR WATER TO TRAVEL TO THE FOUNDATION



GRAVITY TIE

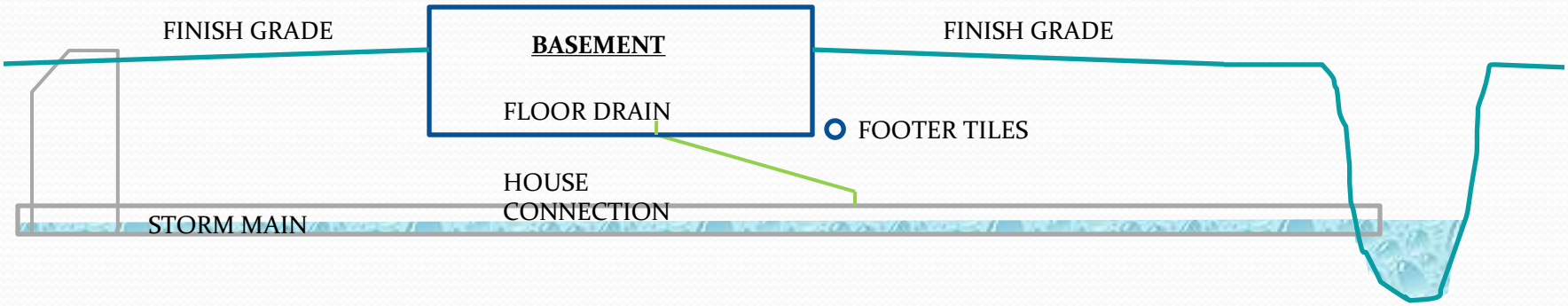
- STORM MAIN IS IN SURCHARGE CONDITION DURING MAJOR RAIN EVENTS
- WATER MIGRATES UP THE STORM CONNECTION
- WATER FLOODS THE BASEMENT
  - FOUNDATION DRAIN
  - FLOOR DRAIN (IF CONNECTED TO STORM)

GRAVITY TIE-BASEMENT FLOODING



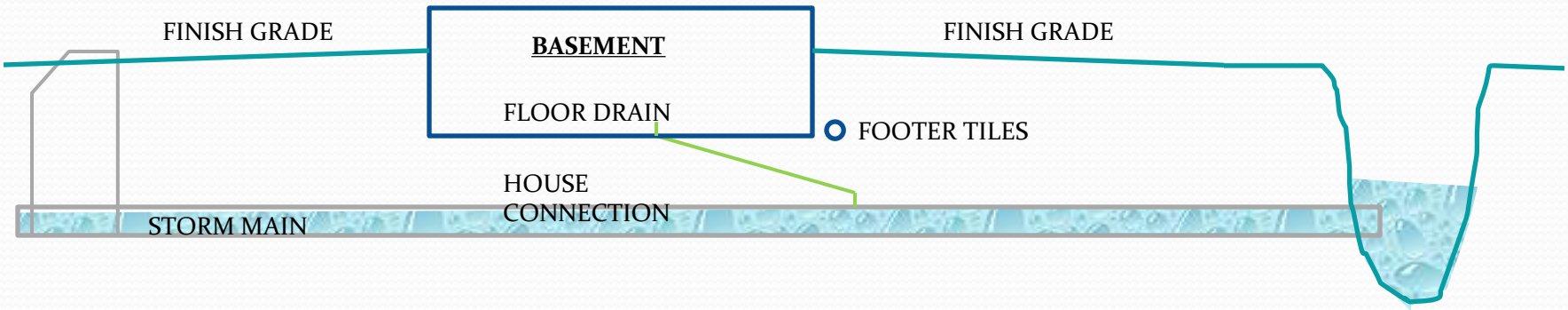
RAIN EVENT CAUSES INCREASE FLOWS IN DITCH

GRAVITY TIE-BASEMENT FLOODING



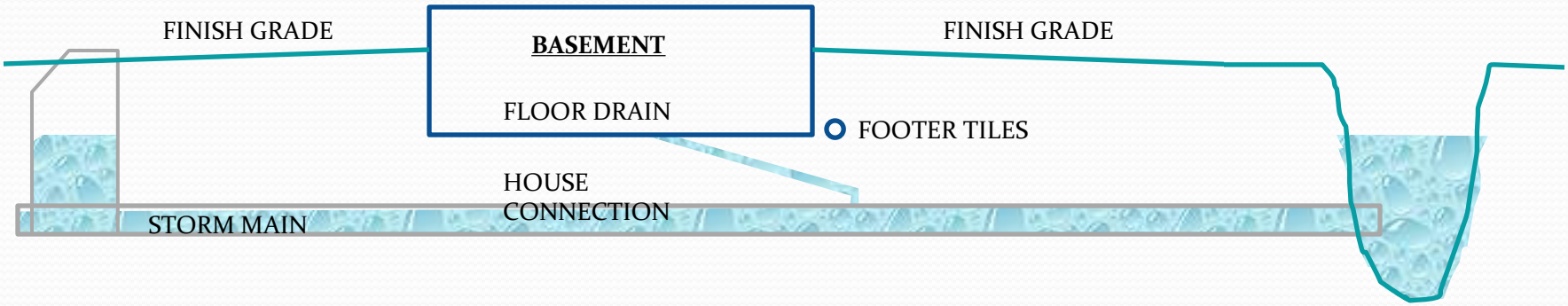
AS RAIN EVENT PROGRESSES DITCH FLOW INCREASES AND STORM MAIN FLOW INCREASES

GRAVITY TIE-BASEMENT FLOODING



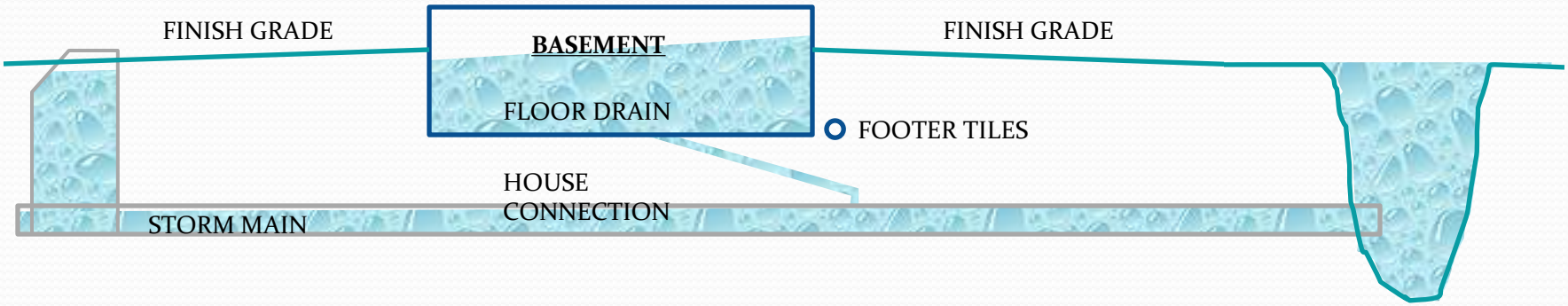
DITCH WATER ELEVATION INCREASES AND STORM MAIN BECOMES SURCHARGED

GRAVITY TIE-BASEMENT FLOODING



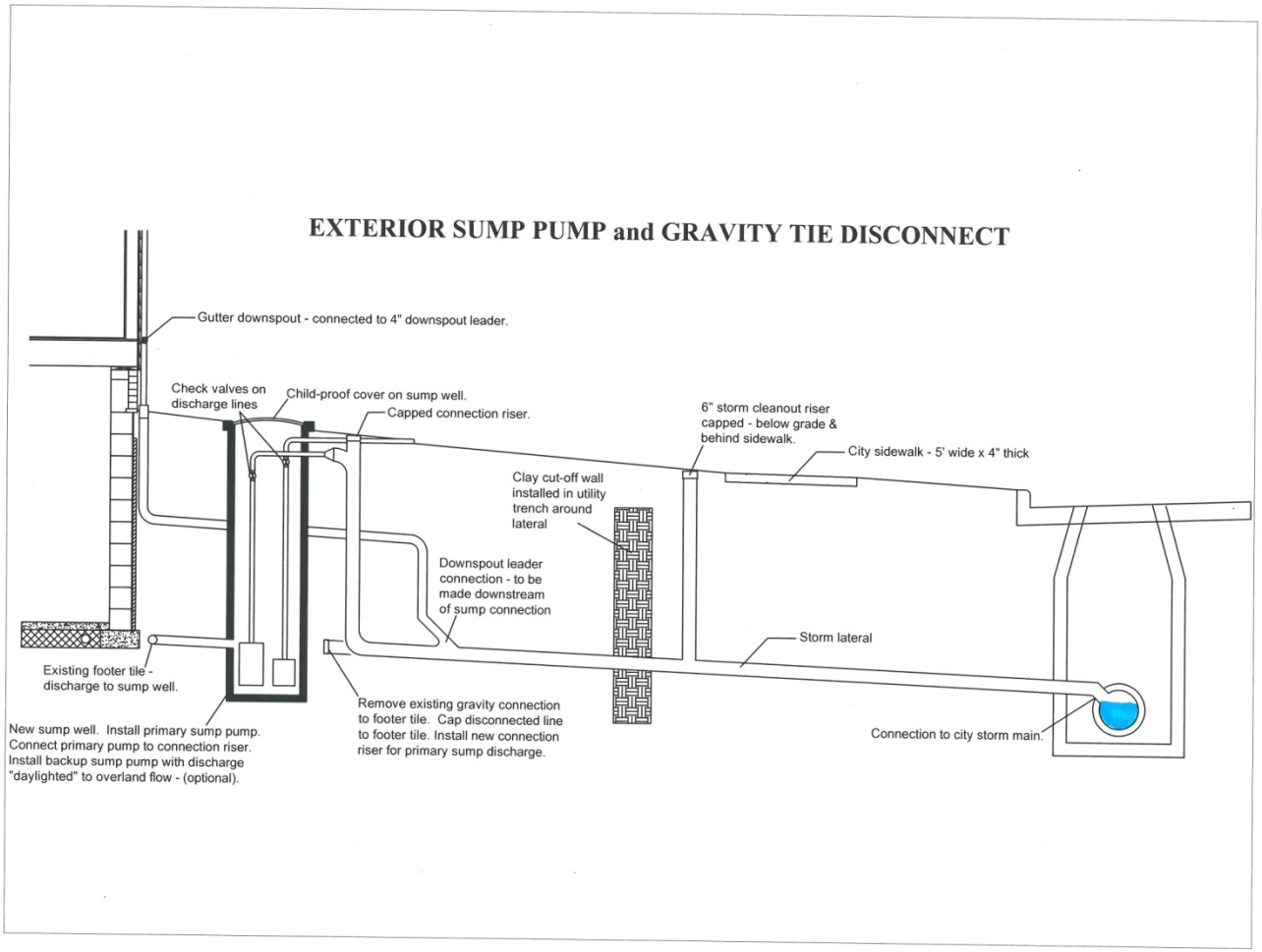
AS STORM MAIN SURCHARGES WATER MIGRATES UP THE STORM CONNECTION

GRAVITY TIE-BASEMENT FLOODING



AS DITCH APPROACHES FLOOD STAGE WATER FLOODS THE BASEMENT THRU THE FLOOR DRAIN AND/OR FOUNDATION DRAIN. WATER SEEKS THE FLOOD STAGE ELEVATION

EXTERIOR SUMP PUMP-GRAVITY TIE DISCONNECT



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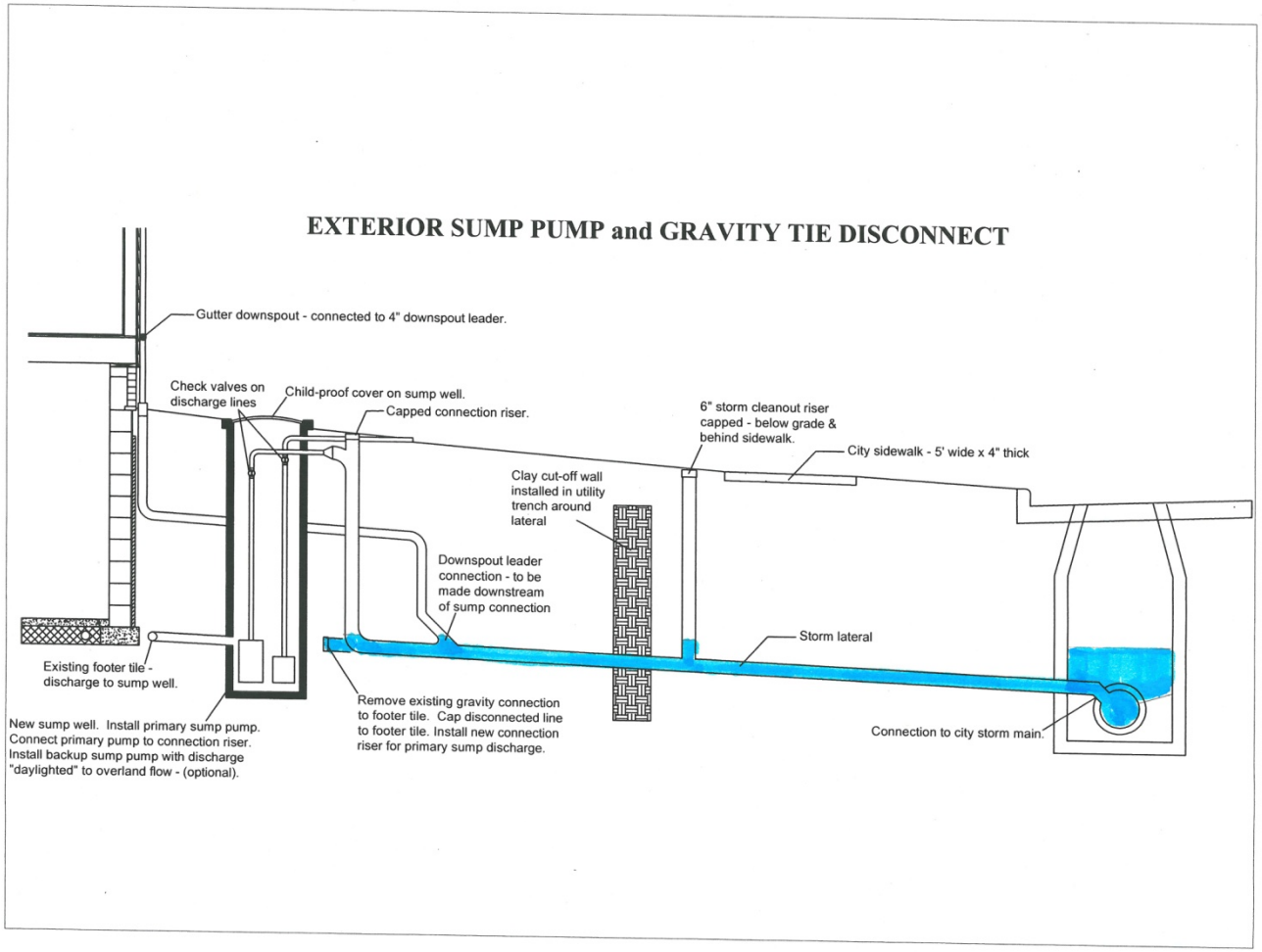

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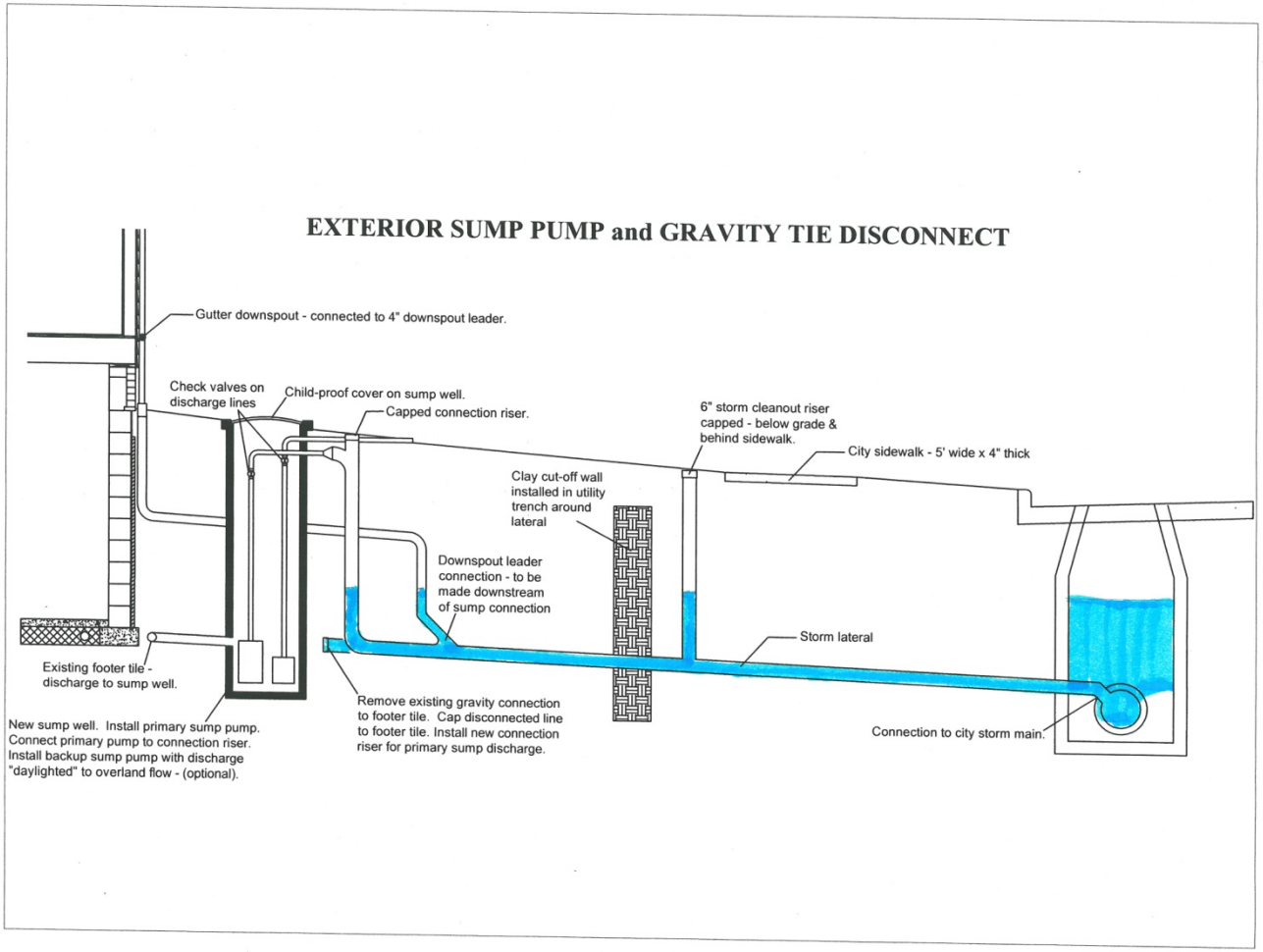

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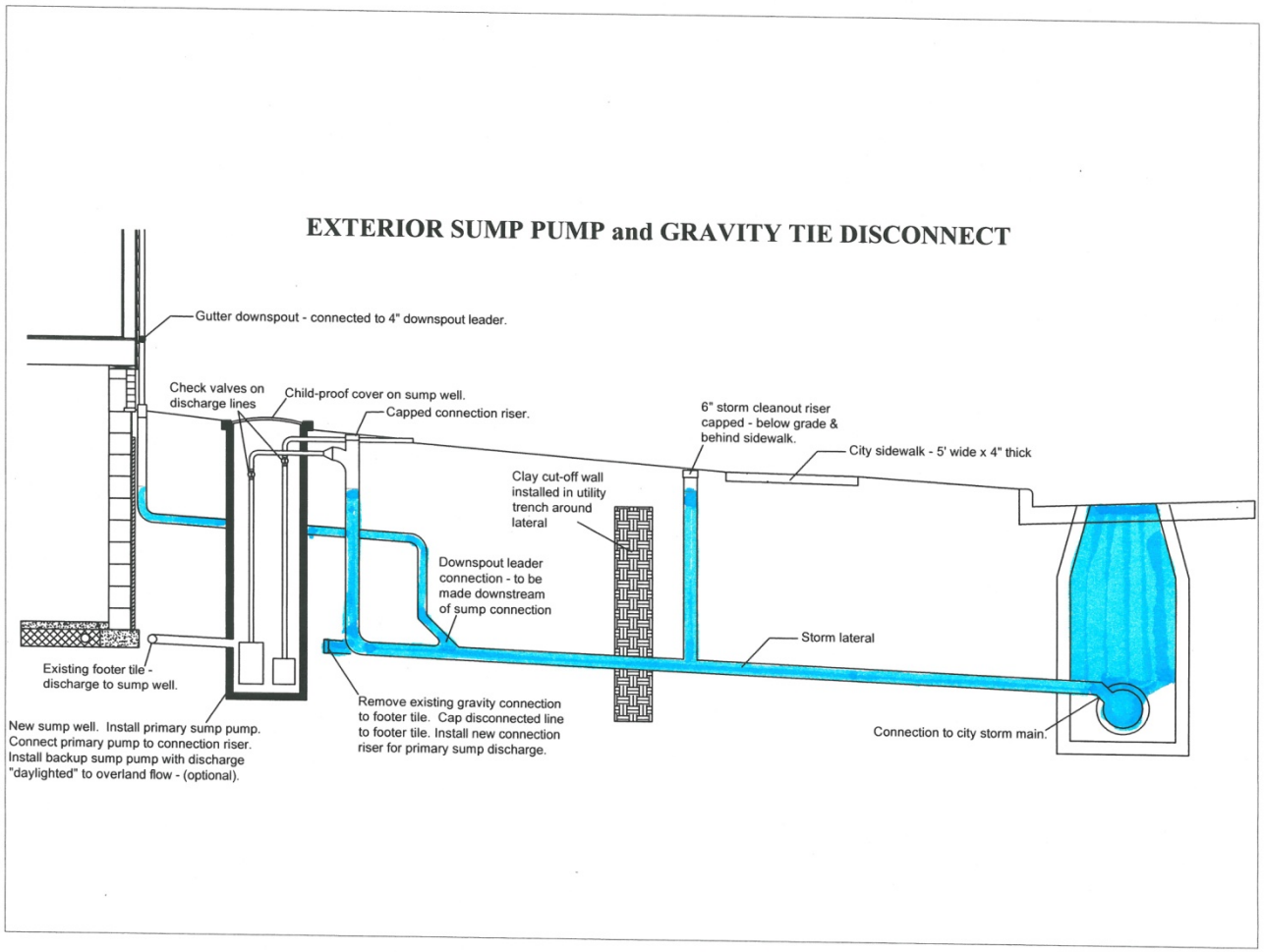
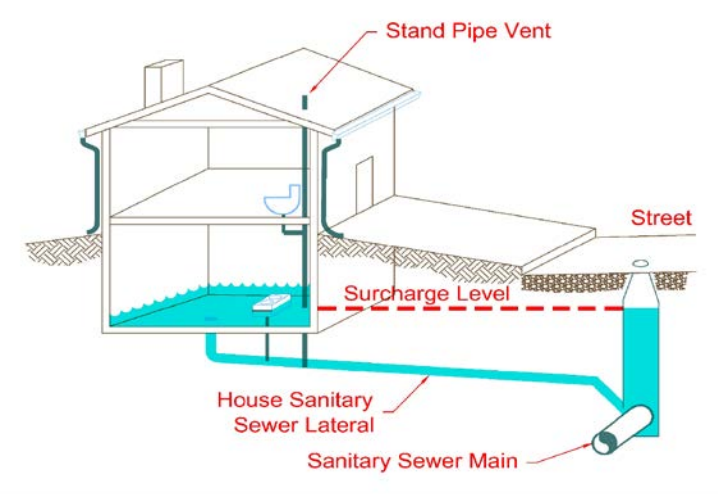


SANITARY SEWER BACK-UP

- RESULTS FROM THE SANITARY SEWER BEING SURCHARGED DUE TO FLOODED STREETS

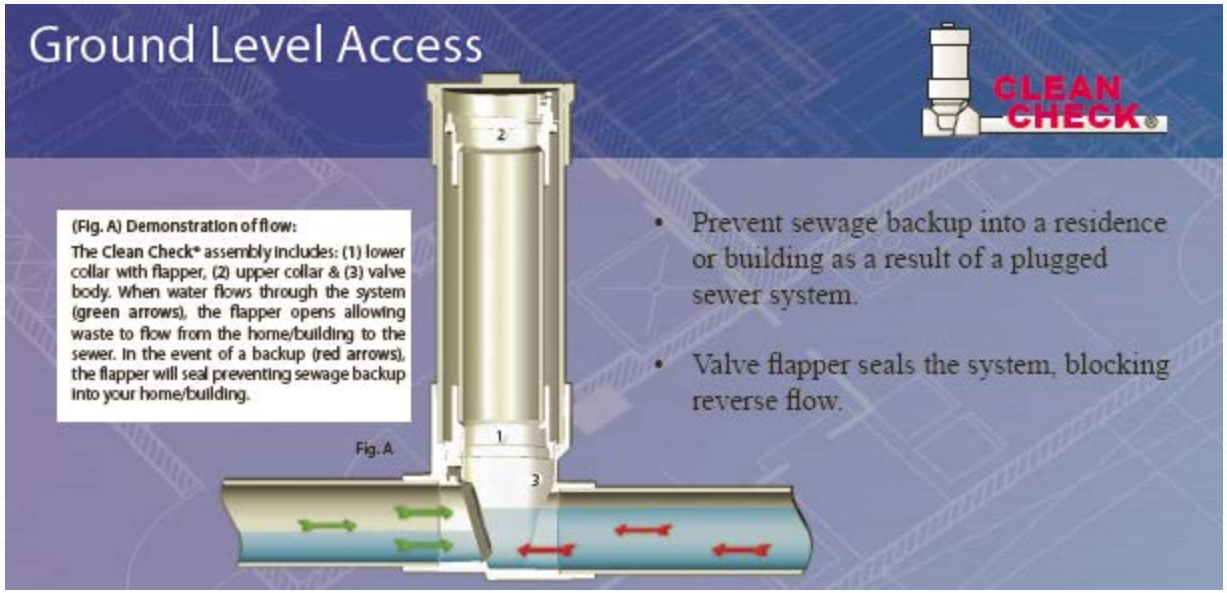
- WATER FROM THE SANITARY SEWER BACKS UP THRU THE CONNECTION AND FLOODS THE BASEMENT:
  - FLOOR DRAINS
  - BASEMENT TOILET
  - BASEMENT SHOWER



EXTERNAL BACKWATER VALVE

- BENEFITS
  - FLAPPER ACCESSED THRU RISER, MH NOT REQUIRED
  - PIPES UNDER THE HOUSE NOT SUBJECTED TO PRESSURE

- BRANDS
  - CLEAN CHECK (75 PSI MODEL AVAILABLE IN 4 MONTHS)
  - CANPLAS (CURRENT MODEL IS RATED AT 60 PSI)

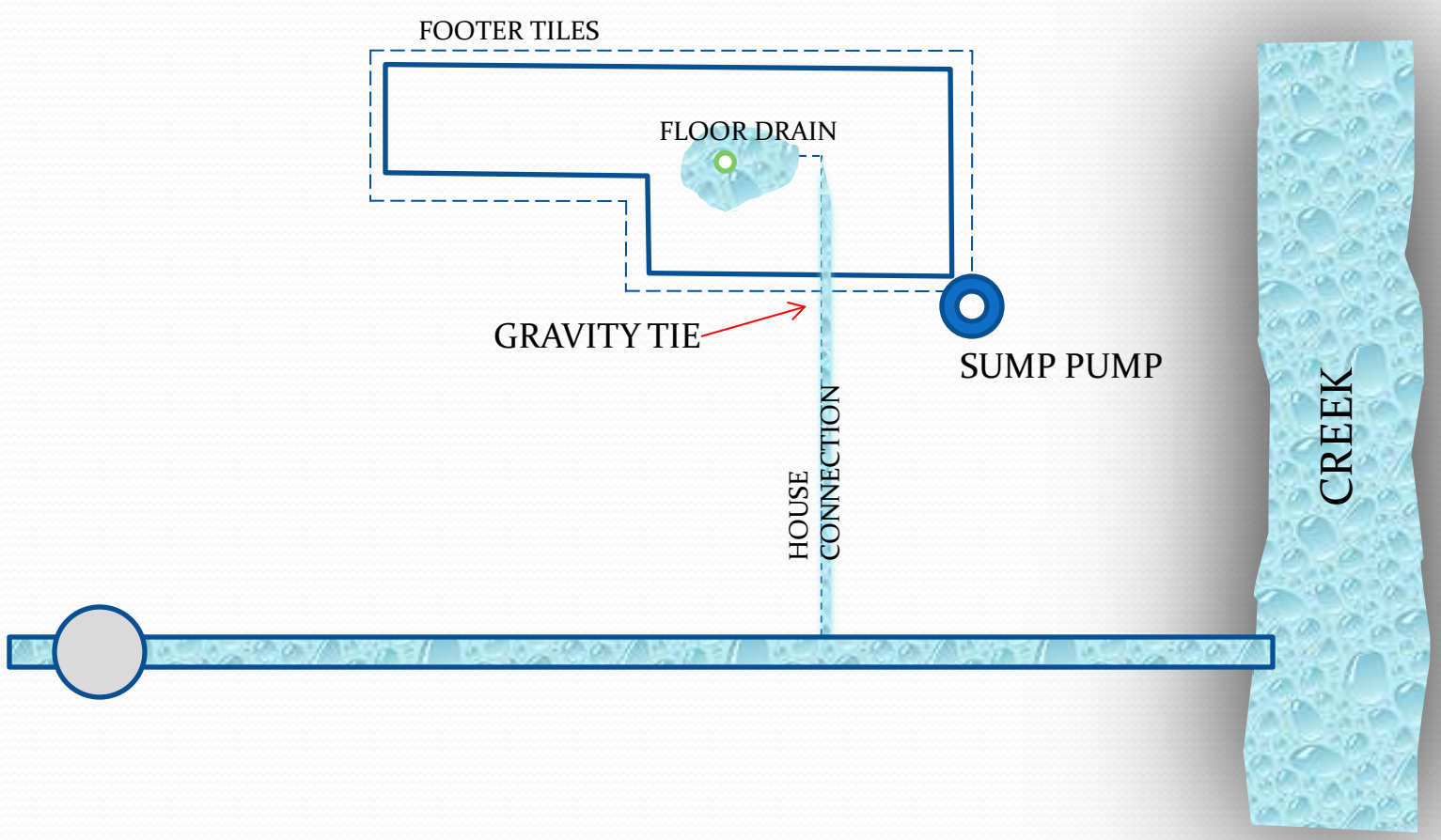


IMPROPER WATER MITIGATION FOR STORM WATER SURCHARGE

- STAND PIPE (USE FOR SANITARY ONLY)
  - FLOOR DRAIN IS PROTECTED
  - BASEMENT WILL FLOOD FROM FOUNDATION DRAIN
- SUMP PUMP WITHOUT GRAVITY TIE DISCONNECT
  - BASEMENT WILL STILL FLOOD SINCE THE GRAVITY TIE IS NOT DISCONNECTED

SUMP PUMP WITH GRAVITY TIE

- BASEMENT WILL STILL FLOOD FROM THE FLOOR DRAIN



MAJOR FLOOD EVENT

- THE FEDERAL GOVERNMENT DETERMINED THAT **FLOODS CAN NOT BE STOPPED**

- RECOMMENDATIONS
  - FEDERAL AND STATE
    - BUY FLOOD INSURANCE
  - CITY OF WESTLAKE
    - **FLOOD PROOF YOUR HOUSE**
    - MITIGATING WET OR FLOODED BASEMENT BROCHURE – INFORMATION AND SOLUTIONS
      - DEPARTMENT OF ENGINEERING WEB PAGE @ www.cityofwestlake.org

FEMA

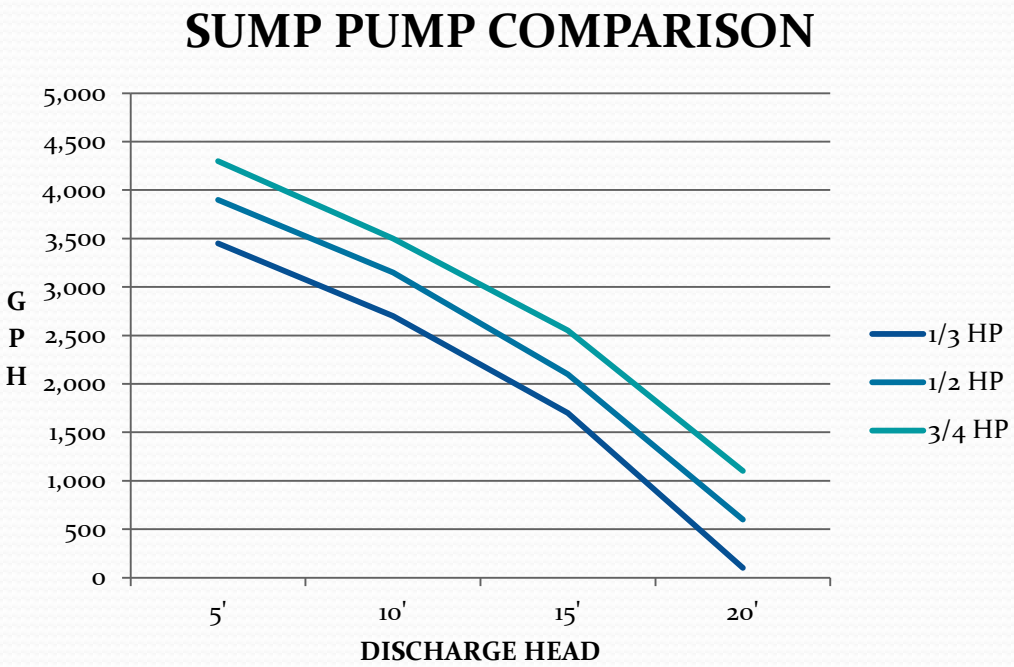
BE FLOOD ALERT

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD PROOF YOUR HOUSE

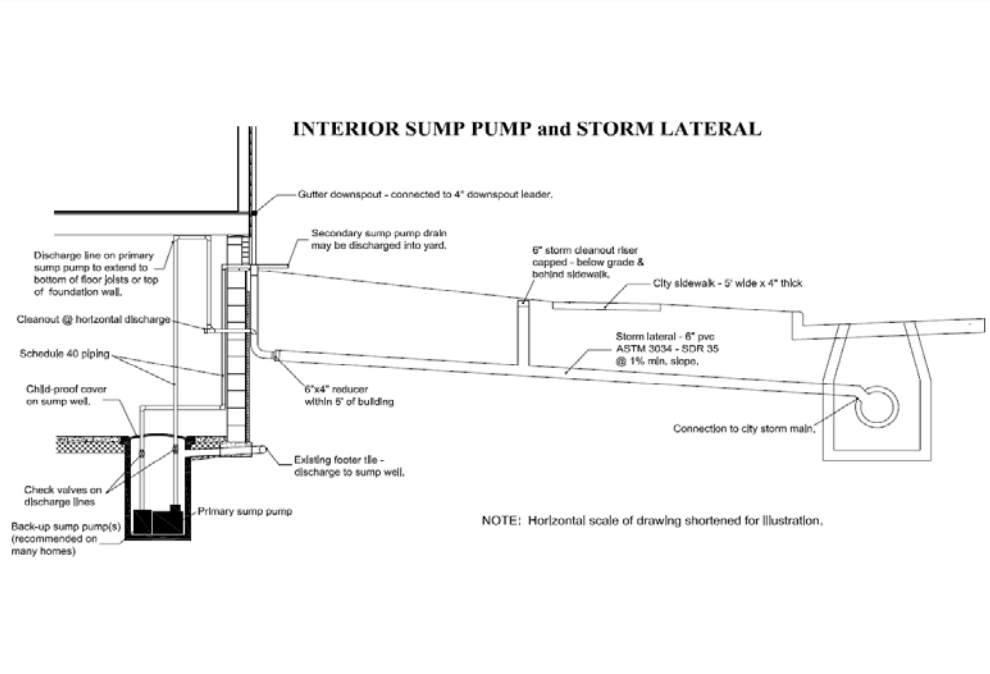
- VERIFY ALL EXTERIOR PLUMBING IS IN GOOD WORKING ORDER
  - FOUNDATION DRAIN SYSTEM
  - DOWNSPOUT LEADERS
  - STORM CONNECTION
- MAINTAIN POSITIVE DRAINAGE AWAY FROM HOUSE
- PROTECT YOUR HOUSE FROM SANITARY BACK-UP, IF YOUR AREA IS IN FLOOD PLAIN.
- HAVE ADEQUATE PUMPING CAPACITY FROM SUMP PUMP.

ALL SUMP PUMPS ARE NOT CREATED EQUAL



- WHEN STORM MAINS ARE SURCHARGED THE DISCHARGE HEAD INCREASES.
- AT LEAST ½ **HP** PUMP IS RECOMMENDED.
- KEEP IN MIND SUMP PUMPS USUALLY LAST ABOUT 7 YEARS
- SECOND PUMP SHOULD DISCHARGE TO GRADE TO OVERCOME SURCHARGED STORM MAIN

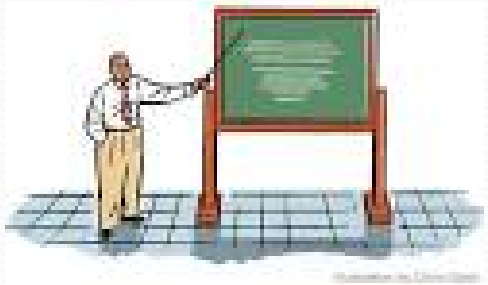
DUEL SUMP PUMP



- PRIMARY SUMP PUMP TO STORM CONNECTION
- BACK-UP SUMP PUMP DISCHARGE TO GRADE
- BACK-UP SUMP PUMP
  - ELECTRIC
  - WATER
  - BATTERY

EDUCATION

- EDUCATION IS KEY TO PROPER FLOOD MITIGATION
- USING THE PROPER TECHNIQUES IS CRITICAL
- PLUMBERS ARE EXPERTS
- LEAVE ENGINEERING ADVICE TO ENGINEERS.
- THE CITY HAS PROFESSIONAL EXPERTS TO MAKE SURE YOU SPEND YOUR HARD EARNED MONEY WISELY



THE END

- QUESTIONS OR COMMENTS