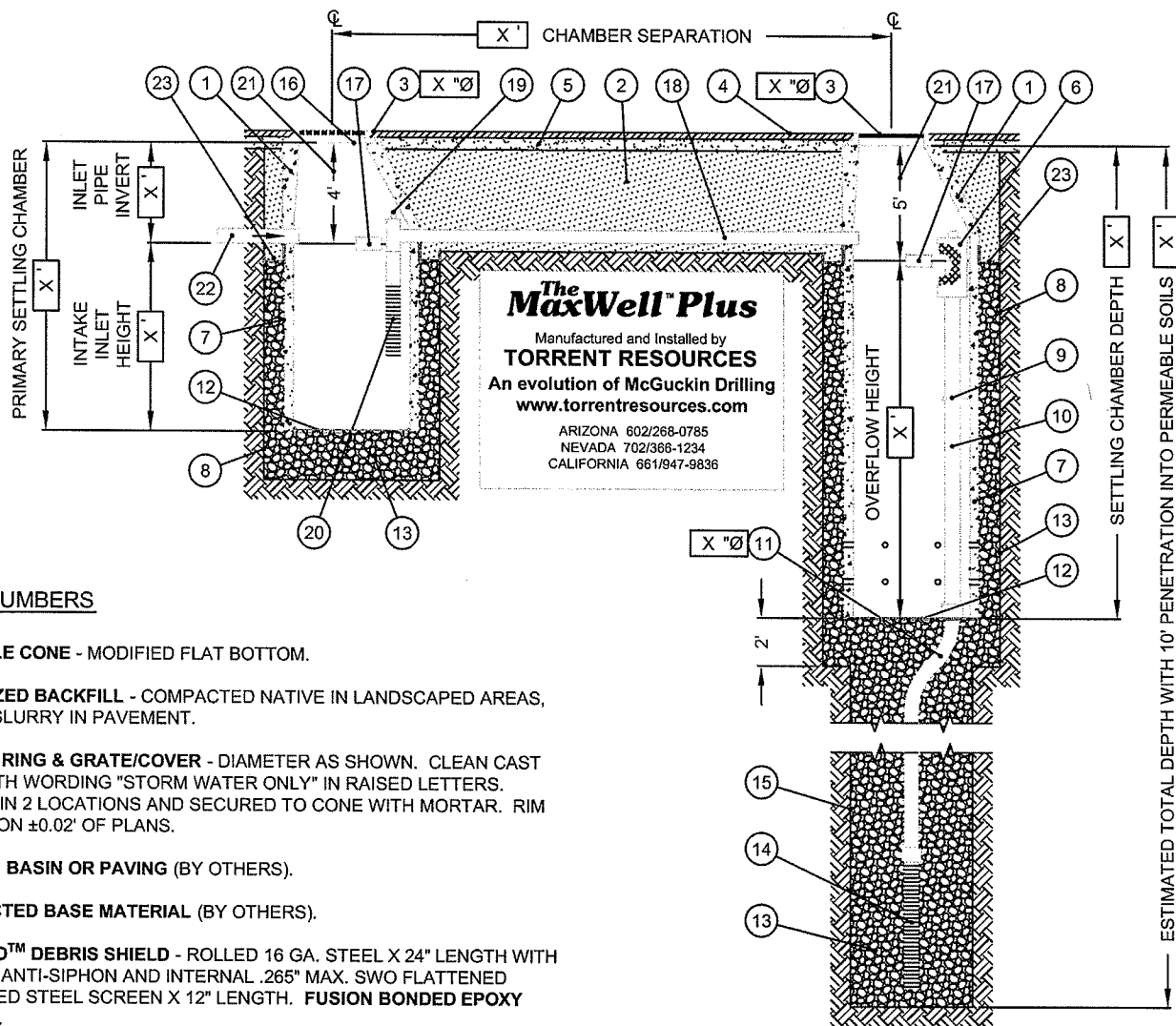


# The MaxWell™ Plus Drainage System Detail And Specifications



## ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **STABILIZED BACKFILL** - COMPACTED NATIVE IN LANDSCAPED AREAS, 1 SACK SLURRY IN PAVEMENT.
3. **BOLTED RING & GRATE/COVER** - DIAMETER AS SHOWN. CLEAN CAST IRON WITH WORDING "STORM WATER ONLY" IN RAISED LETTERS. BOLTED IN 2 LOCATIONS AND SECURED TO CONE WITH MORTAR. RIM ELEVATION  $\pm 0.02'$  OF PLANS.
4. **GRADED BASIN OR PAVING** (BY OTHERS).
5. **COMPACTED BASE MATERIAL** (BY OTHERS).
6. **PUREFLO™ DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL .265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED.**
7. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE AND ALIGN SECTIONS TO MAXIMIZE BEARING SURFACE.**
8. **MIN. 6' Ø DRILLED SHAFT.**
9. **SUPPORT BRACKET** - FORMED 12 GA. STEEL. **FUSION BONDED EPOXY COATED.**
10. **OVERFLOW PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
11. **DRAINAGE PIPE** - ADS HIGHWAY GRADE WITH TRI-A COUPLER. **SUSPEND PIPE DURING BACKFILL OPERATIONS TO PREVENT BUCKLING OR BREAKAGE. DIAMETER AS NOTED.**
12. **BASE SEAL** - GEOTEXTILE, POLY LINER OR CONCRETE SLURRY.
13. **ROCK** - CLEAN AND WASHED, SIZED BETWEEN 3/8" AND 1-1/2" TO **BEST COMPLEMENT SOIL CONDITIONS.**
14. **FLOFAST™ DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. DIAMETER VARIES 96" OVERALL LENGTH WITH TRI-B COUPLER.
15. **MIN. 4' Ø SHAFT** - DRILLED TO **MAINTAIN PERMEABILITY OF DRAINAGE SOILS.**
16. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER AT PROJECT COMPLETION.**
17. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ CAPACITY.
18. **CONNECTOR PIPE** - 4" Ø SCH. 40 PVC.
19. **VENTED ANTI-SIPHON INTAKE WITH FLOW REGULATOR.**
20. **INTAKE SCREEN** - SCH. 40 PVC 0.120" MODIFIED SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. 48" OVERALL LENGTH WITH TRI-C END CAP.
21. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE PRIMARY/SECONDARY SETTLING CHAMBER DEPTHS AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE CONNECTOR PIPE OVERFLOW.
22. **OPTIONAL INLET PIPE** (BY OTHERS).
23. **MOISTURE MEMBRANE** - 6 MIL. PLASTIC. PLACE SECURELY AGAINST ECCENTRIC CONE AND HOLE SIDEWALL. USED IN LIEU OF SLURRY IN LANDSCAPED AREAS.

AZ Lic. ROC070465 A. ROC047067 B-4. ADWR 363  
 CA Lic. 528080, C-42, HAZ.  
 NV Lic. 0035350 A - NM Lic. 90504 GF04  
 U.S. Patent No. 4,923,330 -™ Trademark 1974, 1990, 2004

*The watermark for drainage solutions.*



May 9th, 2005

MSA Consulting  
34-200 Bobe Hope Drive  
Rancho Mirage, California 92270

Attention: Mr. Julian DeLaTorre

Dear Julian,


As requested, the accompanying **MaxWell™** Drainage Products catalog and specification data are forwarded for your resources.

For most applications involving the disposal of runoff and nuisance water flows from impermeable surfaces, we recommend the use of our **MaxWell Plus** System. This dual-chambered design pre-treats the water twice prior to disposal for the removal of suspended solids and floating petroleum-based organic compounds. Offering unmatched efficiency, this product has been endorsed as the specified standard of quality by numerous municipalities in Arizona and California, as well as the Arizona Department of Environmental Quality.

The reliability of our **MaxWell** structures has been field-proven for more than three decades across five states in the greater Southwest. In fact, more than 99% of the 40,000 systems we have installed since 1972 are still in service.

If additional information would be helpful, please do not hesitate to contact us. We look forward to further opportunities to be of service.

Sincerely,

  
Roger L. Williams  
Technical Marketing Representative  
Torrent Resources, Inc.

Encl.

Torrent Resources Incorporated  
1509 East Elwood Street  
Phoenix Arizona 85040-1391

phone 602-268-0785  
fax 602-268-0820

[www.TorrentResources.com](http://www.TorrentResources.com)

AZ Lic. ROC070465 A, ROC047067 B-4; ADWR 383  
CA Lic. 528080 A, C-42, HAZ  
NV Lic. 0035350 A - NM Lic. 90504 GFD4

An evolution of McGuckin Drilling

# Design Suggestions

FOR RETENTION AND DRAINAGE SYSTEMS

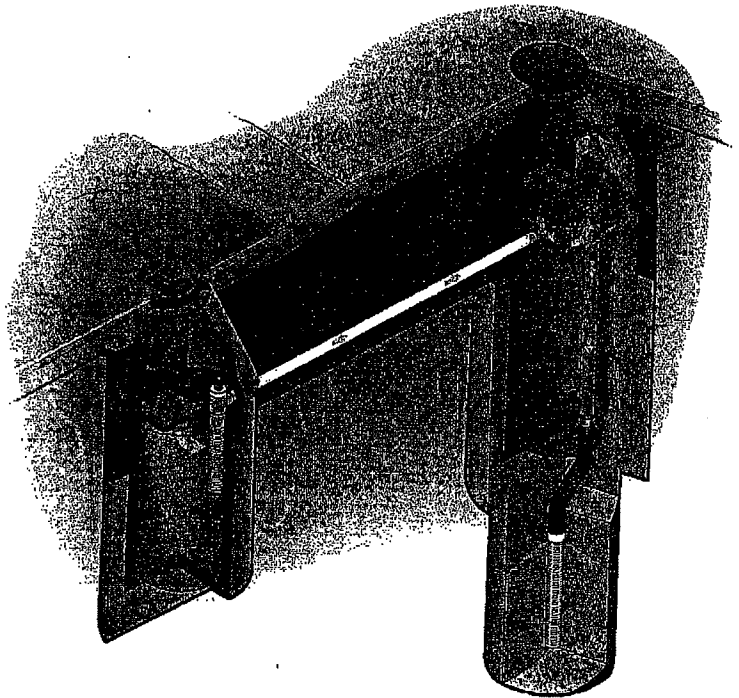


## THE MAXWELL™ CONCEPT

Since 1974, over 40,000 MaxWell™ Systems have proven their value as a cost-effective solution in a wide variety of drainage applications. Earlier experience had shown that the silt and debris that flow into a conventional storm water drywell could quickly cut short its life by clogging the soils meant to transmit water. Pavement sediment could contribute to these problems by further restricting long-term performance.

As a result, engineers have been specifying MaxWell Systems to bring an end to these life-expectancy problems and provide a practical solution to drainage requirements.

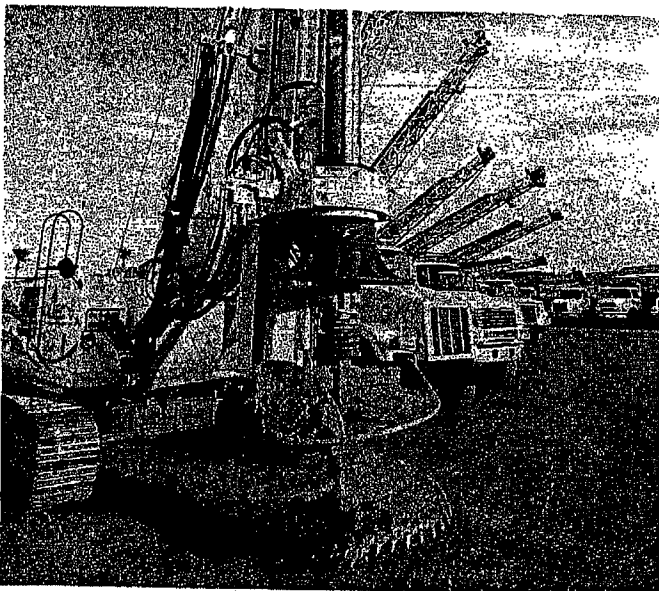
Common to all MaxWells is large settling capacity combined with a carefully designed drainage assembly. The drawing shown here of a MaxWell Plus™ illustrates the patented overflow process on which the system works. Incoming water from the surface grated inlet is received in the Primary Settling Chamber where silt and other heavy particles settle to the bottom. A PureFlo™ Debris Shield ensures containment by trapping floating debris and pavement oil. Suspended matter is filtered out by an intake screen while a floating absorbent sponge wicks residual pavement oils and compounds from the water. The pre-treated flow is then regulated to a constant rate and directed to a secondary settling chamber. The settling and containment process is repeated, thereby



MAXWELL PLUS

effectively achieving controlled uniform treatment. The system is drained as water rises under the PureFlo Debris Shield and spills into the top of the overflow pipe. The drainage assembly returns the cleaned water to the surrounding soil through the FloFast™ drainage screen.

Equally important to long life is the care taken in drilling the drywell and installing the components. At least 10 feet of penetration with a large, 4-foot diameter hole into the permeable, clay-free sand, gravel and cobbles is vital. Torrent's specially designed, "crowd"-equipped rigs get through difficult cemented soils to reach clean drainage soils at depths up to 180 feet. Additionally, the firm's proprietary techniques assure that soils will stay clean from the drilling operation through initial well use.



## RETENTION FACILITY DESIGN CONSIDERATIONS

Most municipalities require storm water be retained on site to minimize the peak flow from storm events and to mitigate flooding. Disposal of the retained water is then required within an acceptable time period. The retention volume required on a given property should be calculated according to the requirements of the municipality or local jurisdiction. Generally, any rainfall in excess of these requirements is allowed to overflow to the streets or storm sewers.

Since no allowance is made for soil or drywell transmissibility, the retention facility must be designed to retain 100% of the calculated rainfall volume. Most retention is achieved using parking lots, landscaped areas or a combination of the two.

With parking lots, the most important design factor is user convenience.

Although most municipalities allow up to 36 hours to dissipate retained water, practical application normally prescribes drainage times of 4 to 6 hours. Parking lot retention should be designed so that most of the water is stored away from the project's buildings to minimize pedestrian inconvenience during storms and with acceptable depth to allow safe vehicle traffic.

Ideally, deeper perimeter landscaped retention combined with even pavement storage provides the best balance. Such decisions should consider parking lot size and loading, kind of business, major storm frequency and the drainage facilities installed for disposing of the retained water.

The speed with which water is removed, thus the number of **hours acceptable** for disposal, is determined by the number of **MaxWells** and their transmissibility.

*See Calculating MaxWell Requirements.*

**Landscaped retention areas** can contribute significantly to both the aesthetic and functional qualities of the property they protect. Where space permits, landscaped retention areas might take the form of a depressed grass area, a rockscape, a playground or even a golf course.

Unlandscaped retention basins are definitely not recommended since their silt erosion can result in premature aging of drywells. Landscaped retention should be designed to drain quickly so that plants or grass are not damaged. The MaxWell™ Plus System allows for nuisance water to be intercepted in the drainage-way, enabling the retention basin bottom to stay dry between storm events and minimizing basin maintenance. To match the appropriate drywell inlet structure to your retention facility, refer to MaxWell and Envibro™ System Surface Treatments and Details on the following page.

## CALCULATING MAXWELL REQUIREMENTS

1. Determine the total cubic feet of **required retention** needed to meet code.
2. Determine the number of **hours acceptable** for disposal of water retained.
3. Determine the **TOTAL CFS** of disposal needed to drain retention in the hours acceptable.

2000 gpm = 4.46 cfs

$$\text{TOTAL CFS} = \frac{\text{Required Retention (ft}^3\text{)}}{\text{Hours Acceptable} \times 3600}$$

4. Determine the appropriate **individual well percolation test rate**:
  - a) For non-critical applications, known soil data can be the basis for estimated percolation rates. Torrent maintains extensive records including maps and related drilling logs from past projects. From this data, Torrent personnel can quickly determine likely soil conditions and an associated **individual well percolation test rate** for most sites requiring drywells.



- b) For large projects, sites with critical drainage demands, or to verify well performance, an actual constant-head percolation test is recommended. Constant-head testing closely simulates actual working conditions and provides data that is accurate for standard MaxWell designs installed in any soil condition. It is common practice to install one drywell in a required location and then test the completed well. By testing a finished well, performance is optimized and the number of required wells is minimized. Over \$135,000 was saved for a major semiconductor facility through this testing method.

Because MaxWells will often accept test water faster than a water truck or spigot can provide it, Torrent utilizes a percolation testing apparatus that can bring water to the well from a fire hydrant 1/2 mile or more away through large

13406pm

diameter lines. Flow rates up to 3.0 cubic feet per second (CFS) are measured by precision totalizing flow meters to arrive at an **individual well percolation test rate**. For certified tests, monitoring by a soils laboratory can be arranged.

For assistance in estimating individual well percolation rates or arranging a percolation test, contact the Torrent Design Staff.

5. Determine the **Number of MaxWell Systems** required using either of the following methods:
  - a) Standard MaxWell settling chamber depths and drainage components are engineered for disposal rates of from 0.25 to 0.50 CFS per system, depending on head of water. For general applications draining retained storm water, use (1) standard **MaxWell IV** for up to 1 acre of paved surfaces and up to 3 acres of landscaped contributory area. For large paved surfaces, subdivision drainage, nuisance water drainage or other demanding applications, use (1) standard **MaxWell Plus** for up to 2 acres of paved surface and up to 5 acres of landscaped contributory area, or
  - b) Where applicable soil and site conditions permit higher system disposal rates, or if a percolation test is in order, calculate the number of MaxWells as follows:

$$\text{Number of MaxWell Systems} = \frac{\text{Total CFS} \times A_f}{\text{Individual Well Percolation Test Rate}}$$

$A_f$  = derating factor for well aging. Use a factor of 2 for coarse grained soils and 3 for fine grained soils. Stiff or hard soils may require a higher factor.

Based upon soil data, either use the general guidelines in (a) or if (b) is appropriate, consult the Torrent Design staff to engineer a design that meets your site's specific requirements.

6. Select and specify the desired MaxWell System based upon the size and type of property to be drained. Where drainage areas are impacted by industrial operations, the **Envibro™ System** may be recommended.

Please refer to Product Literature for specific MaxWell and Envibro design requirements. For additional design considerations, CAD drawings, or site-specific instructions, contact the Torrent Design Staff for no-charge assistance in any phase of your planning.

### STANDARD INLET GRATES & COVERS

All inlet castings are clean cast iron with wording "Storm Water Only" in raised letters. Rings are cast to fit either 24" or 30" manhole openings. All castings are bolted in two locations for safety unless otherwise noted. Open area of grates matches capacity of respective drainage system components as follows:

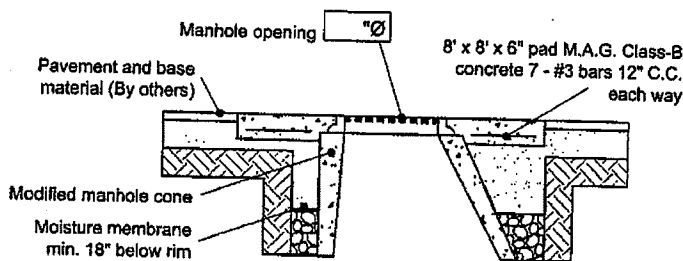
Manhole Opening	Grate Casting Style	Matches Drainage Component
24"	Traffic	6"
24"R	Landscaped	6"
30"	Traffic, Landscaped	8" or 12"

"R" denotes reversible inset casting option for landscaped applications. Add a "C" to casting number for M.H. Cover option.

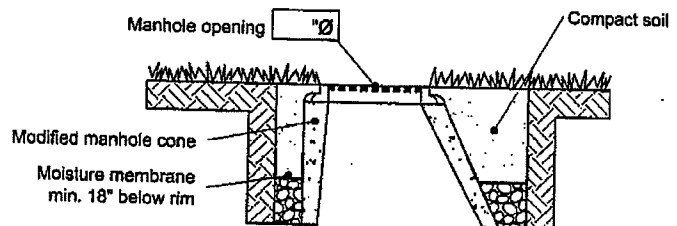
### MAXWELL™ AND ENVIBRO™ SYSTEM SURFACE TREATMENTS AND DETAILS

Drawing A, B, C or D may be used in place of the top portion of the standard system detail to adapt it to the varying surface conditions shown.

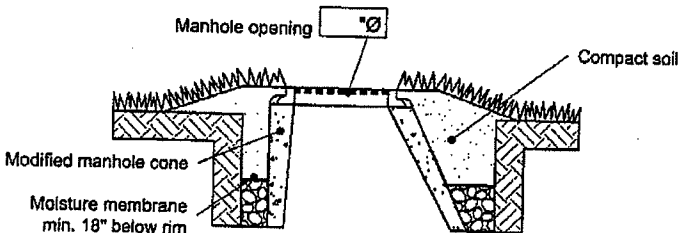
A. Adds concrete pad for heavy traffic areas.



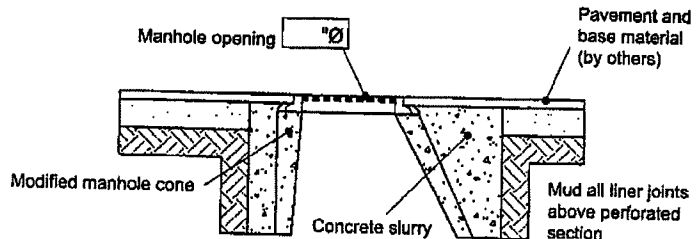
B. For landscaped retention ponds and planters. No paving or pad. In areas where silt might flow to drywell, use C.



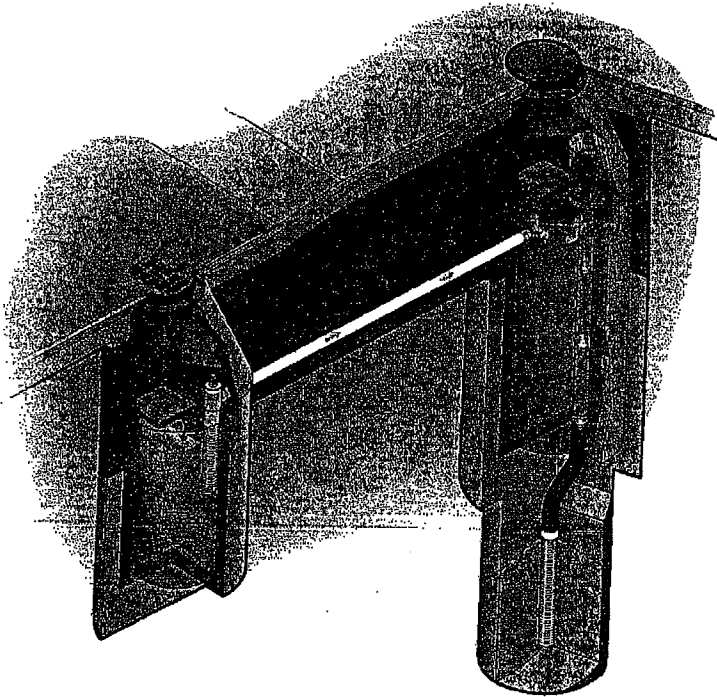
C. Use in landscaped retention/detention basins or where heavy silt flow is anticipated. Height should be 4"±.



D. A special design where unstable soil conditions could cause surface subsidence. Also installed with connecting pipes and trenches.



The **MaxWell™ Plus**, as manufactured and installed exclusively by Torrent Resources Incorporated, is the industry standard for draining large paved surfaces, nuisance water and other demanding applications. This patented system incorporates state-of-the-art pre-treatment technology.



In the **MaxWell Plus**, preliminary treatment is provided through collection and separation in deep large-volume settling chambers. The standard MaxWell Plus system has over 2,500 gallons of capacity to contain sediment and debris carried by incoming water. Floating trash, paper, pavement oil, etc. is effectively stopped by the **PureFlo™ Debris Shields** in each chamber. These shielding devices are equipped with an effective screen to filter suspended material and are vented to prevent siphoning of floating surface debris as the system drains.

### EFFECTIVE PROCESSING

Incoming water from the surface grated inlets or connecting pipes is received in the Primary Settling Chamber where silt and other heavy particles settle to the bottom. A **PureFlo™ Debris Shield** ensures containment by trapping floating debris and pavement oil. The pre-treated flow is then regulated to a design rate of up to 0.25cfs and directed to a secondary settling chamber. The settling and containment process is repeated, thereby effectively achieving controlled, uniform treatment. The system is drained as water rises under the **PureFlo Debris Shield** and spills into the top of the overflow pipe. The drainage assembly returns the cleaned water to the surrounding soil through the **FloFast™ Drainage Screen**.

### ABSORBENT TECHNOLOGY

To provide prompt removal of pavement oils, both **MaxWell Plus** settling chambers are equipped with absorbent sponges. These floating pillow-like devices are 100% water repellent and literally wick petrochemical compounds from the water. Each sponge has a capacity of over 128 ounces to accommodate effective, long-term treatment. The absorbent is completely inert and will safely remove runoff constituents down to rainbow sheens which are typically no more than one molecule thick.

### SECURITY FEATURES

MaxWell Plus Systems include bolted, theft-resistance, cast iron gratings and covers as standard security features. Special inset castings which are resistant to loosening from accidental impact are available for use in landscaped applications. Machined mating surfaces and "Storm Water Only" wording are standard.

### THE MAXWELL FIVE-YEAR WARRANTY

*Innovative engineering, quality materials and exacting construction are standard with every MaxWell system produced and installed by Torrent Resources Incorporated. The MaxWell Drainage Systems Warranty is the best in the industry and guarantees against failures due to workmanship or materials for a period of five years from date of completion.*

### THE ULTIMATE IN DESIGN

Since 1974, over 40,000 MaxWell™ Systems have proven their value as a cost-effective solution in a wide variety of drainage applications. They are accepted by state and municipal agencies and are a standard detail in numerous drainage manuals. Many municipalities have recognized the inherent benefits of the MaxWell Plus and now require it for drainage of all paved surfaces.

### SUPERIOR PRE-TREATMENT

Industry research, together with Torrent Resource's own experience, has shown that initial storm drainage flows have the greatest impact on system performance. This "first flush" occurs during the first few minutes of runoff and carries the majority of sediment and debris. Larger paved surfaces or connecting pipes from catch basins, underground storage, etc. can also generate high peak flows which may strain system function. In addition, nuisance water flows require controlled processing separate from normal storm runoff demands.

Manufactured and Installed Exclusively by Torrent Resources Incorporated  
Please see reverse side for additional information

U.S. Patent No. 4,923,330™ Trademark 1974, 1987, 2004

# MAXWELL™ PLUS DRAINAGE SYSTEM DETAIL AND SPECIFICATIONS

## CALCULATING MAXWELL PLUS REQUIREMENTS:

The type of property, soil permeability, rainfall intensity and local drainage ordinances determine the number and design of MaxWell Systems. For general applications draining retained storm water, use **one standard MaxWell Plus per the instructions below** for up to 5 acres of landscaped contributory area, and up to 2 acres of paved surface. To drain nuisance water flows in storm runoff systems, **add a remote inlet** to the System. For smaller drainage needs, refer to our *Type IV MaxWell*. For industrial drainage, our *Envibro™ System* may be recommended. For additional considerations, please refer to "**Design Suggestions For Retention And Drainage Systems**" or consult our Design Staff.

## COMPLETING THE MAXWELL PLUS DRAWING

To apply the *MaxWell Plus* drawing to your specific project, simply fill in the blue boxes per the following instructions. For assistance, please consult our Design Staff.

### PRIMARY SETTLING CHAMBER DEPTH

The overall depth of the Primary Settling Chamber is determined by the amount of surface area being drained. Use a standard depth of **10 feet** for the initial acre of contributory drainage area, **plus 2 feet** for each additional acre, up to the design limits of the property type noted in "Calculating MaxWell Plus Requirements" noted above. Other conditions that would require increased chamber depths are property usage, maintenance scheduling, and severe or unusual service conditions. Connecting Pipe Depth may dictate deeper chambers so as to maintain the effectiveness of the settling process.

### ESTIMATED TOTAL DEPTH

The Estimated Total Depth is the approximate total system depth required to achieve 10 continuous feet of penetration into permeable soils, based upon known soil information. Torrent's specialized "crowd" equipped rigs get through the difficult cemented soils to reach clean drainage soils at depths up to **180 feet** and their extensive drilling log database is available to use as a reference.

### SETTLING CHAMBER DEPTH

On *MaxWell Plus* Systems of over 30 feet overall depth and up to 0.25cfs design rate, the standard Settling Chamber Depth is **18 feet**.

### OVERFLOW HEIGHT

The Overflow Height and Settling Chamber Depth determine the effectiveness of the settling process. The higher the overflow pipe, the deeper the chamber, the greater the settling capacity. An overflow height of **13 feet** is used with the standard settling chamber depth of **18 feet**.

### DRAINAGE PIPE

This dimension also applies to the *PureFlo™* Debris Shields, the *FloFast™* Drainage Screen, and fittings. The size is based upon system design rates, multiple primary settling chambers, soil conditions, and need for adequate venting. Choices are 6", 8", or 12" diameter. Refer to our company's "**Design Suggestions for Retention and Drainage Systems**" for recommendations on which size best matches your application.

### BOLTED RING & GRATE/COVER

Standard models are quality cast iron and available to fit 24" Ø or 30" Ø manhole openings. All units are bolted in two locations with wording "Storm Water Only" in raised letters. For other surface treatments, please refer to "Design Suggestions for Retention and Drainage Systems."

### INLET PIPE INVERT

Pipes up to 24" in diameter from catch basins, underground storage, etc. may be connected into the primary settling chamber. Inverts deeper than 4 feet will require additional depth in both system settling chambers to maintain respective effective settling capacities.

### INTAKE INLET HEIGHT

The Intake Inlet Height determines the effectiveness of the settling process in the Primary Settling Chamber. A minimum inlet height of **6 feet** is used with the standard primary settling chamber depth of 10 feet. Greater inlet heights would be required with increased system demands as noted in Primary Settling Chamber Depth.

### CHAMBER SEPARATION

The standard separation between chambers is **15 feet** from center to center for inlet pipe inverts up to 7 feet. For deep inlet pipes or underground storage systems that result in a deeper Connector Pipe, add 5 feet of separation for each 3 feet of additional Connector Pipe depth. Maximum Connector Pipe depths and Chamber separations are 13 feet and 25 feet, respectively. A pump and lift station is recommended for systems with deeper requirements.